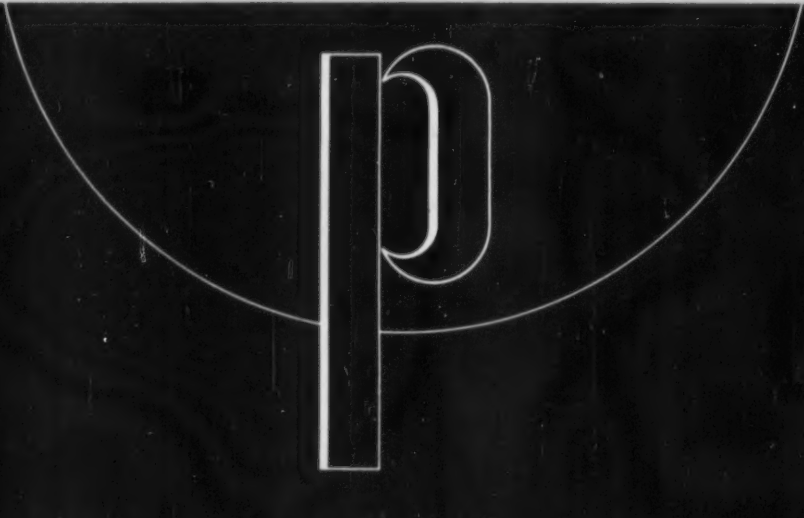


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MODERN PLASTICS



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SEPTEMBER 1955

What's Happening to the POLYETHYLENES?...Page 85

Jobs That ROTATIONAL MOLDING Can Do...Page 123

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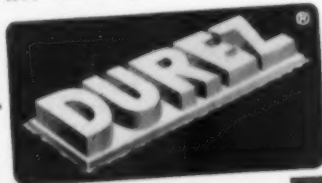
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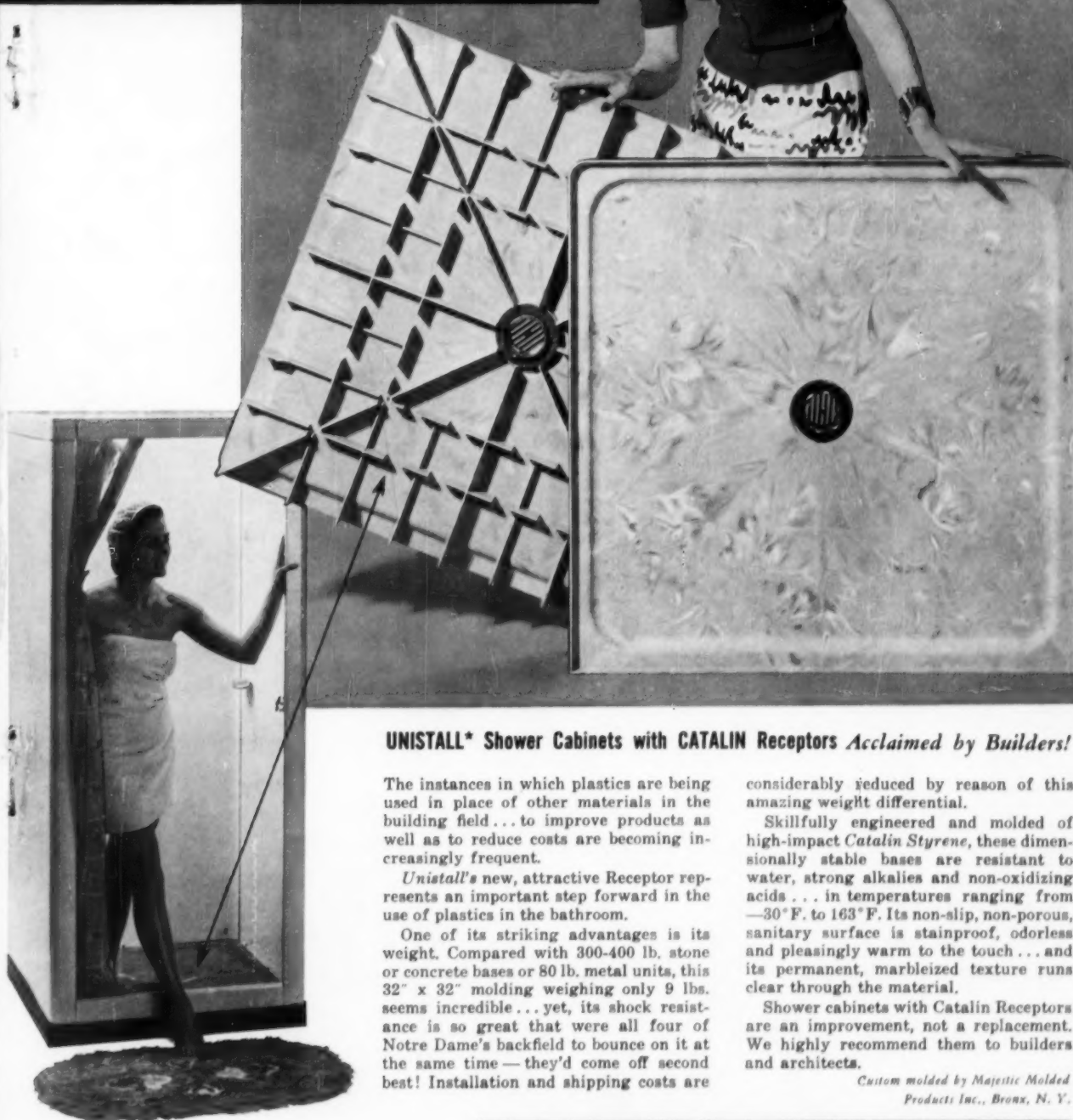


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MODERN PLASTICS*

September 1955 • Vol. 33, No. 1

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News of the Industry, Predictions and interpretations; Company News; Personal; Meetings

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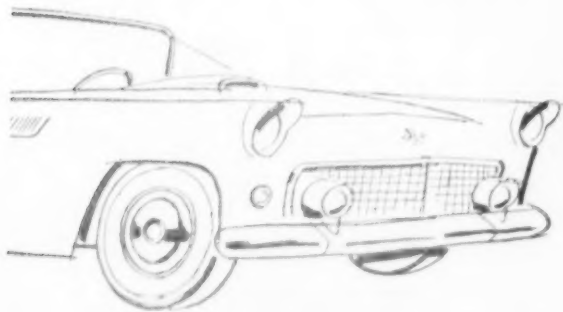
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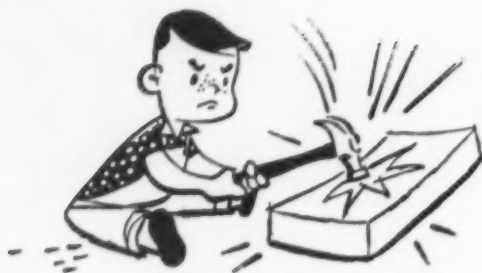
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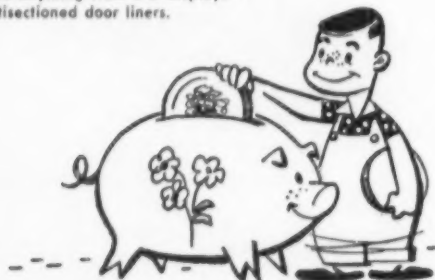


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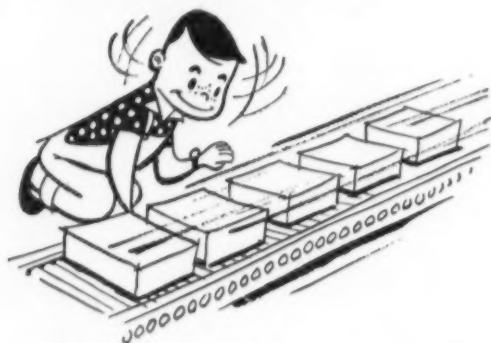


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EDITORIAL

A Bigger, Better Range of Resins

In clubs and restaurants, on planes, wherever plastics industry executives are gathered these days, the chief informal topic of conversation is "Who is now going to make what kind of material?"

With twelve companies now offering a variety of polyethylenes, seven companies now selling nylons of one kind or another, with more companies going into the vinyls and still others embarking on programs of copolymerization and alloying, a natural corollary question is "Where can they hope to sell all that stuff?"

A study of the past history of the plastics industry, of course, provides the basis of an answer. Some of these materials will supersede non-plastics materials and even other plastics materials in present applications. Others will be used in the creation of products not now on the market.

To the industrial end user of plastics materials, whether in molded or fabricated components or in the form of adhesives, coatings, and industrial resins, this increased availability of plastics resins, coupled with the broadening of the ranges of properties available through specialized versions of the resins, is a wonderful thing. It will mean that the designer and development engineer working on a new product or a new application will be able to pinpoint his properties requirements and to select a plastics material that will exactly suit his needs. It will also give an impetus to the trend of the past few years toward the design of products exclusively in plastics.

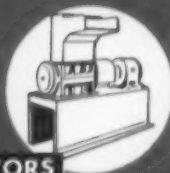
To the molder, the extruder, the sheet forming processor, and the fabricator, the multiplicity of materials sources and the increase in the ranges of specific properties available can be both a blessing and a headache. It may no longer be necessary to hedge on tool design in order to discount slight negative factors in materials otherwise quite satisfactory—because there will be more materials to choose from. At the same time, this whole development will involve the processor's technical and engineering and sales staffs in an intensive and continuing study of materials and their properties and the methods of using them so that they may present to customers the clearest possible picture of what they can do with any given material. And it is a well known fact that every end user of plastics and plastics components is always well alerted to the new materials, is perpetually convinced that any newly announced material is superior to anything previously offered, and is going to want his molder or processor to use the newest in materials.

An additional headache for many molders and processors is this: are they big enough and strong enough in finance and in management talent to handle some of the big new markets that will be opened up by this great broadening of the range of plastics? This question, in turn, leads into the matter of market analysis on the part of the custom processor and to the necessity of making decisions on the types of jobs a company will seek, the range of materials with which it will work, and the size and speed of operation it shall be prepared to handle.

Custom molders and processors are thus faced with an ever-increasing burden of industrial statesmanship coupled with growth by demand.

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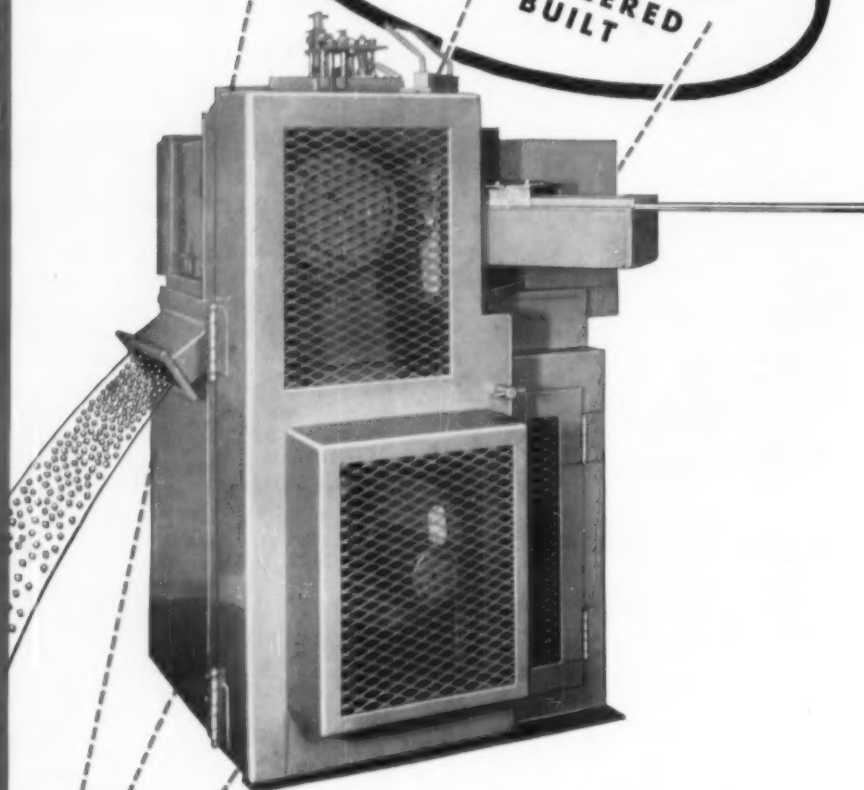


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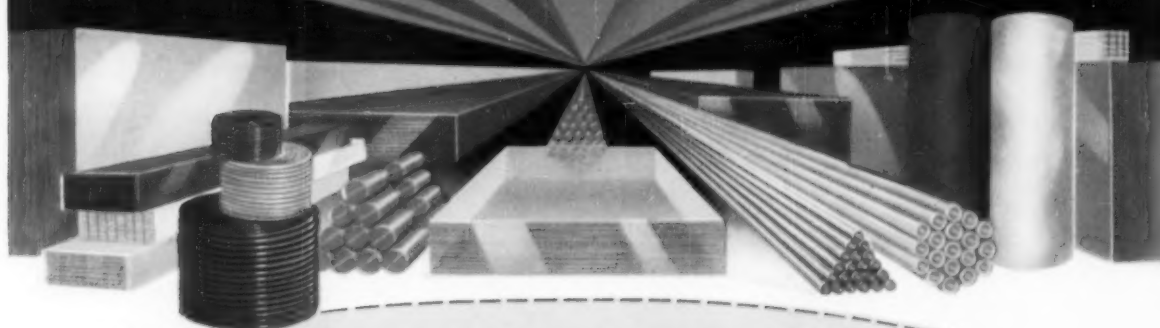
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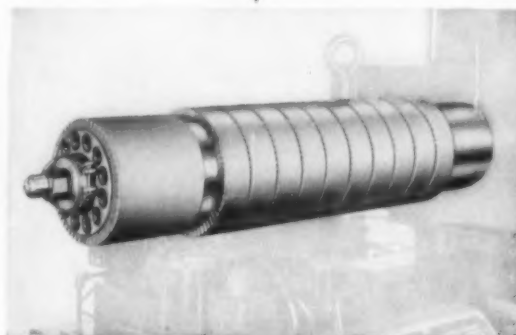
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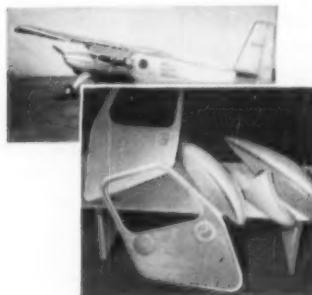
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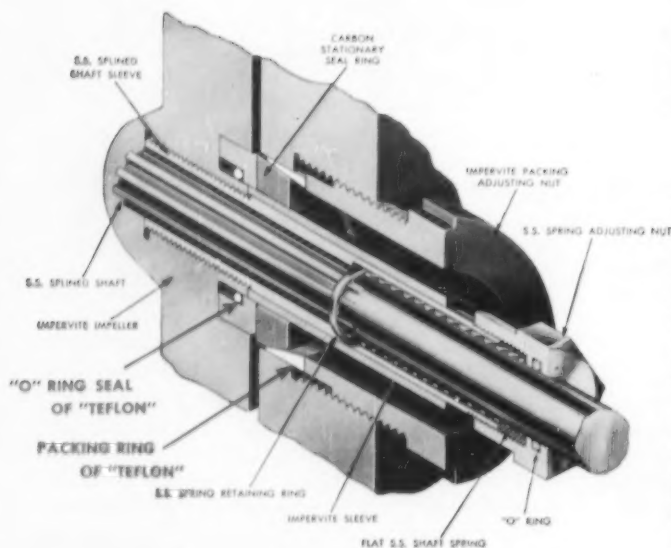


LUCITE® withstands low temperatures and rough treatment—makes an excellent see-through lid for a commercial cold-storage chest.



ALATHON® makes an attractive cake and bread box that won't corrode, dent, break. Handle attaches to make into convenient picnic basket.

4 more examples of

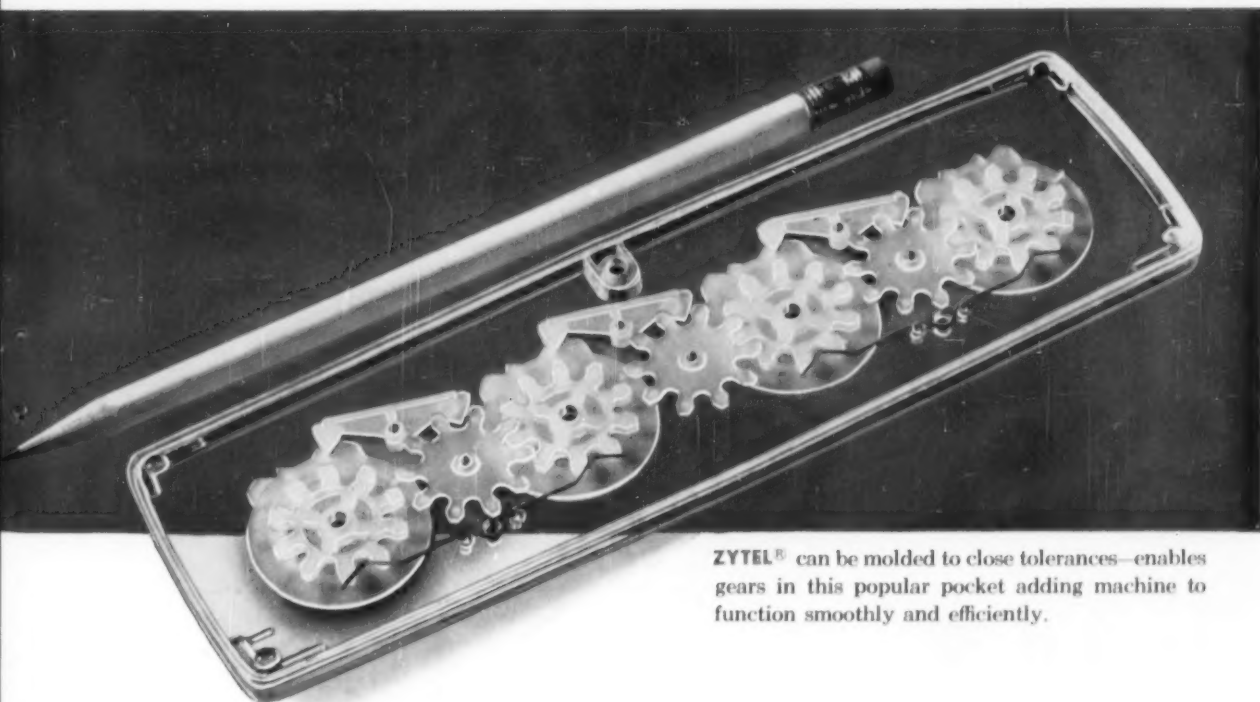


TEFLON® is used for the O-ring seals and packing rings in this centrifugal pump—creates less drag, handles corrosive fluids.

When faced with a difficult design problem, check the Du Pont family of engineering materials. Each of these has a set of unique properties which may help you find an efficient, economical solution to your particular problem.

ZYTEL nylon resin provides parts which are tough and durable. That's why "Zytel" was picked for the gears in a pocket adding machine, according to the manufacturer. This little adding machine has gears of "Zytel" molded to the close tolerances required for smooth, foolproof operation. Other factors which made "Zytel" the choice for these gears were strength and outstanding resistance to abrasion necessary to assure years of dependable service. (Adding machine manufactured by Sterling Plastics Company, Union, New Jersey.)

TEFLON tetrafluoroethylene resin, fabricated in O-ring seals and packing rings, helps improve the design and efficiency of this single-stage centrifugal pump (see cutaway view at left). This pump can handle corrosive fluids in large volume. "Teflon" helps assure leakproof performance. The low coefficient of friction and self-lubricating properties of "Teflon" reduce wear of the O-ring. With O-rings and packing rings of "Teflon," a minimum of maintenance is assured. Because "Teflon" is chemically inert, corrosives can contact the packing ring to make the pump's seal self-cooling. (Impervite pump manufactured by Falls Industries, Inc.,



ZYTEL[®] can be molded to close tolerances—enables gears in this popular pocket adding machine to function smoothly and efficiently.

advanced product engineering

Solon, Ohio. Components of "Teflon" fabricated by Shamban Engineering Company, Culver City, California.)

LUCITE acrylic resin—molded as a lid for a commercial freezing cabinet—withstands low temperature and rough treatment. Used for the storage and self-service of ice cream, this freezer utilizes the superior optical properties of "Lucite." Customers inspect the contents through the sparkling, transparent lid. "Lucite" won't corrode, resists crazing, is easy to keep clean. (Ice Cream Dispensing Cabinet lid of "Lucite" manufactured by General Products Company, Central Falls, Rhode Island, for Savage Arms Corporation of Utica, N. Y.)

ALATHON polyethylene resin is utilized for this attractive housewares item of several uses. The cake and bread box pictured above is light in weight, attractive to the eye, pleasant to the touch. It won't break, dent or corrode, is easy to clean. It makes a handy picnic box, too, with the wire handle in place. Housewares of "Alathon" can be molded efficiently and economically. (Cake box molded by Plastray Corporation, Detroit, Michigan.)

Evaluate your own design problems in terms of the Du Pont engineering materials. For complete property information, use the coupon at right or write to: E. I. du Pont de Nemours & Co. (Inc.), Polychemicals Department, Room 309 Du Pont Building, Wilmington 98, Delaware.



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For new business opportunities in plastics see the **PLASTICS 1955** exhibition of finished products for

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FOR INFORMATION: German-American Trade Promotion Office, Suite 6900, Empire State Building, 350 Fifth Avenue, New York 1, N.Y. Telephone: WIsconsin 7-0727

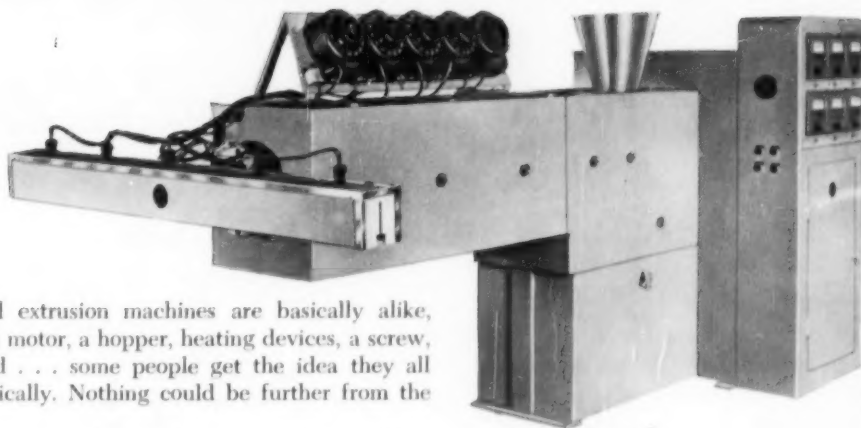


In Germany: **NOWEA** Nordwestdeutsche Ausstellungs-Gesellschaft m.b.H., Ehrenhof 4, Duesseldorf.



Don't believe them when they say:

It's built just like an MPM



Since all extrusion machines are basically alike, consisting of a motor, a hopper, heating devices, a screw, and a diehead . . . some people get the idea they all perform identically. Nothing could be further from the truth.

When you see an MPM extruder in operation, or when you question somebody who has one working in his plant, you will discover that an MPM has certain design and construction features which recommend it above all others.

From the viewpoint of the man in the shop, MPM's exceptional heating and cooling system, superior diehead construction, and powerful drive result in higher production of all manner of extrusions, held to close tolerances.

As far as plant owners are concerned, MPM's offer trouble-free operation, solid corrosion-resistant wearing parts which guarantee long service, and *built-in* flexibility, of great value now and of increasing value as new plastics materials are developed.

It's easy to be misled by superficial resemblances. Before deciding on an extruder for producing flat sheet, wide films, cross-sections, covered wire or some other item, investigate the high productive capacity and additional advantages for which MPM extruders are noted.

This is the 4 1/2" MPM long cylinder extruder. Other sizes available are 1 1/2", 2 1/2", and 3 1/2". MPM also supplies auxiliary equipment such as wind-ups for flat and blown film, wire covering, monofilaments, dryers, granulators, pelletizers and so forth.

West Coast Representative
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CUT WIRE COVERING COSTS

by dry blending with



IN covering wire, quality cannot be sacrificed for cost. However, you can lower cost while maintaining or improving quality through dry blending with PLIOVIC EDB90V.

Dry blending lowers cost by simplifying processing—a single, heated blender replaces the Banbury, the mill, the chopper and the granulator of the wet blend process with corresponding decreases in time, labor and equipment cost.

Dry blending improves quality by reducing the times and temperatures required for thorough compounding—the compound accumulates a shorter heat history than in wet blending and this adds up to better physical properties and longer life.

PLIOVIC EDB90V is the straight polyvinyl chloride resin that permits the benefits of dry blending to be realized in the extrusion of wire covering. It is an electrical grade resin—fully approved by Underwriters' Laboratories as interchangeable with all other electrical grade resins. And it's a dry blending resin.

Careful control of its particle size, shape and distribution permits PLIOVIC EDB90V to form sandy, free-flowing mixes that do not pack or bridge. These compounds also process readily on any type of forming equipment to give end products having excellent physical properties.

Full details on how to cut wire covering costs with dry blending PLIOVIC EDB90V plus information on the other cost-cutting members of the PLIOVIC family are yours by writing to:

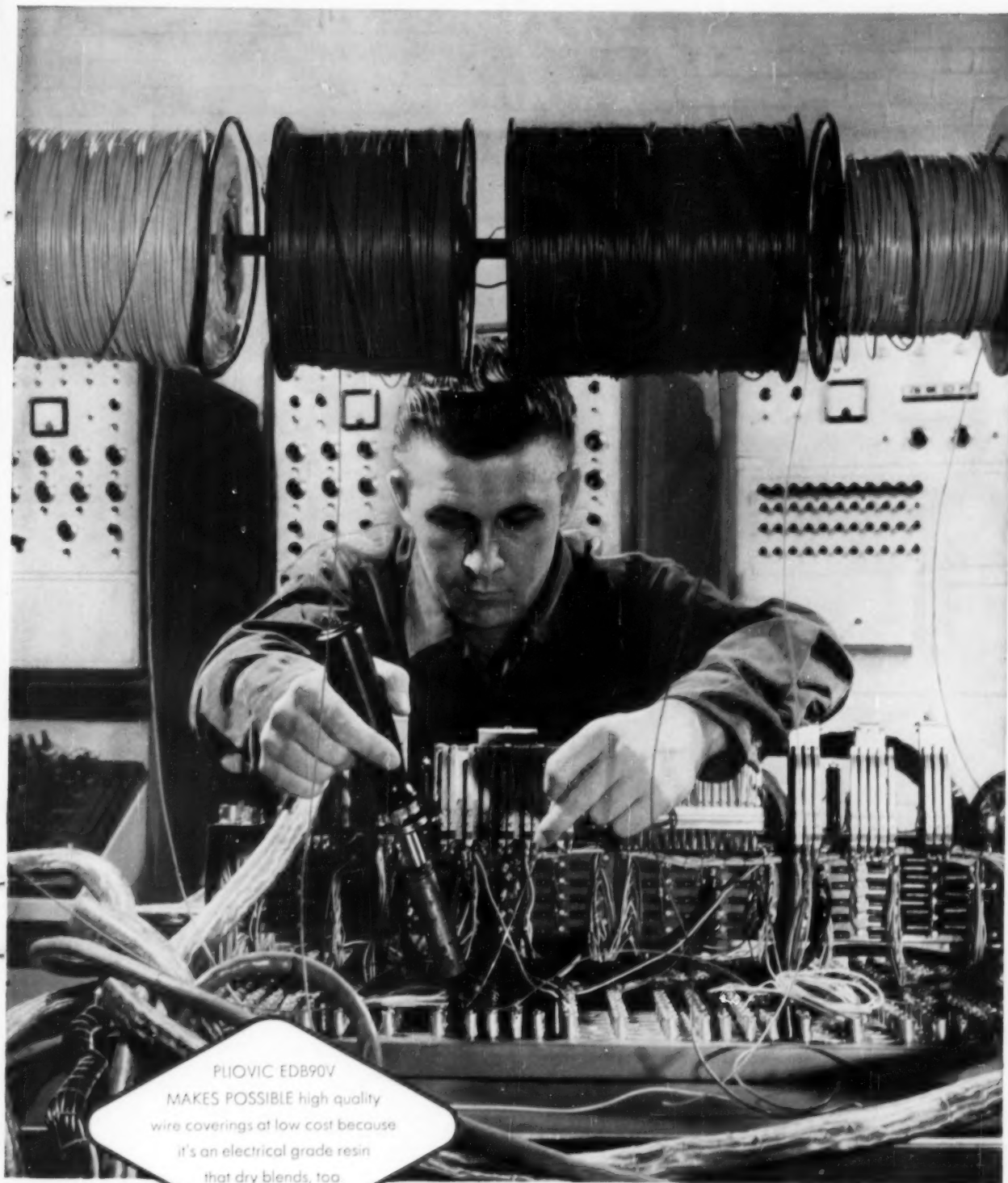
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PLIOVIC EDB90V
MAKES POSSIBLE high quality
wire coverings at low cost because
it's an electrical grade resin
that dry blends, too.

Have
you
tried

CONOCO H-340

as a secondary plasticizer for polyvinyl chloride formulations?

When Conoco H-340 is used to replace up to 25 per cent of the primary plasticizer in polyvinyl chloride formulations, low-temperature flexibility is improved. In plastisols and organosols, flow properties and control of viscosity build-up are greatly improved by incorporation of this secondary plasticizer as part of the total plasticizer used. Tensile and hardness properties are not materially affected. Light stability of formulations in which this plasticizer is used

is outstanding in comparison with those in which other well-known plasticizers are employed.

Conoco H-340 is an almost water-white liquid having a viscosity of about 20 centipoises at 100°F. It is readily available in commercial quantities in either drums or tank cars.

We will be glad to give you further information and samples. Send us your request on your company's letterhead.



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What price these "hot"—
and so-called—minks?



"Duty," says Mort, "is just
for jerks".
Three guesses who will
get the works!

There are many "bargains" in today's buyers' market. The "New Low Price" (to get the business) is often quoted at less than half the going fair price of last year. This is due solely to the desire to fill a press at any price—not, sad to say, due to technical developments. Hence, what price that part when that press can be filled for someone else more profitably? Or when red ink catches up with that molder?

Today, as always, the biggest bargain in custom molded plastic parts is the proper choice of an able, stable molder. You're money ahead when you settle on the company that:



So it figures that Mortimer's just as wise
When it comes to his molded plastics buys.
Cheap tools—and press-time bought under cost—
And tomorrow, his source will be broke or lost.

- Knows its costs today—and tomorrow!
- Will honestly appraise its ability to perform for you
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If your molding needs include thermosetting plastics of any type—or the fluorocarbons—we're a company that's grown for decades by living up to those very specifications. Why not talk your problem over with us—and leave the fire-sale bargains to your competition? We'll come running!

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FOR PRODUCTS ON THE MOVE



◆ **MADE TO LAST**—A product of the Dormeyer Corp., Kingsbury and Huron Sts., Chicago 10, Ill., the "Edge-Well" is guaranteed by the manufacturer for one year against defects in material or workmanship. Hercocel housing by Plastic Precision Parts Co., 2535 West Madison St., Chicago, Ill.

◆ **EASY TO USE**—All it takes to operate the new Dormeyer "Edge-Well" Sharpener is finger-tip pressure on the center bar. For added safety, sharpener stops rotating as soon as pressure is released.

As good looking as it is functional, the new Dormeyer "Edge-Well" Knife and Scissor Sharpener is a valued addition to anyone's kitchen. One sharpening wheel quickly gives a perfect edge to knives of any size or type; the other wheel restores scissors to "like new" cutting condition.

Like so many products today, the "Edge-Well" is molded with Hercocel A—Hercules® cellulose acetate. Long-wearing and durable, Hercocel is the perfect plastic for products that must stand up under hard usage. And Hercocel lends itself to modern styling, provides a finish that means extra sales appeal. In design, production and sales, versatile Hercocel keeps products on the move.

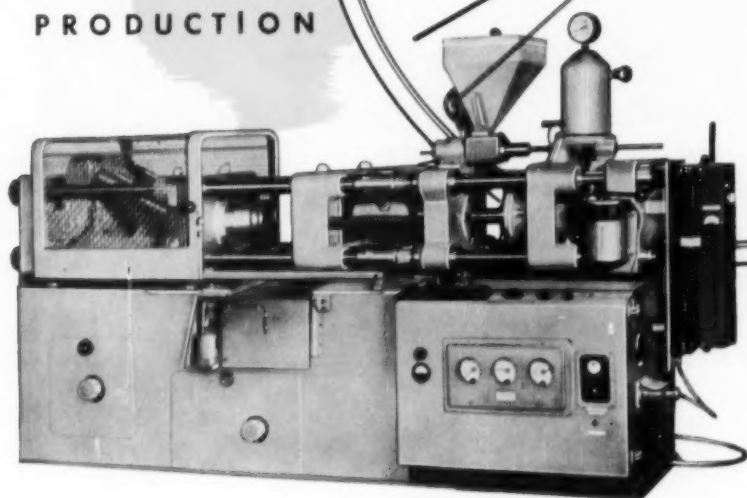


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FULLY AUTOMATIC INJECTION MOULDING MACHINES

1/2 to 50 ozs. capacity



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Easy to handle and simple to mould, Deeglas Chopped Glass Fibre Mat provides the *extra* strength needed to make plastic mouldings stronger and lighter. Its wide use in the aircraft, boat building and automobile industries is evidence of its outstanding advantages — even distribution of fibre, constant density and high tensile strength in all directions.

Deeglas is available pre-impregnated with a variety of resins, and is suitable for moulding by either pressure or vacuum methods.

Further details about Deeglas mat will be gladly supplied, along with samples of rovings, chopped fibre, and yarns.



Deeglas

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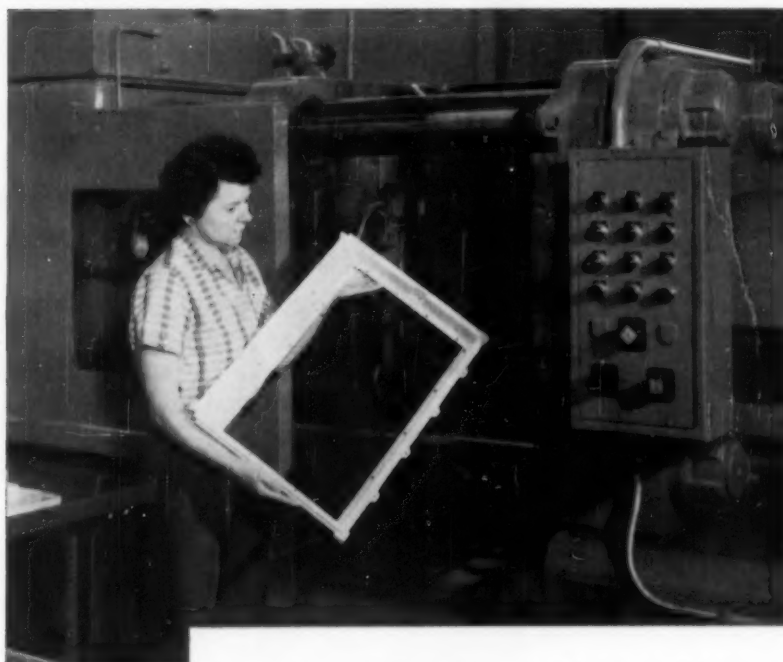
for better mouldings!

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H-P-M**

**20/
28oz.**

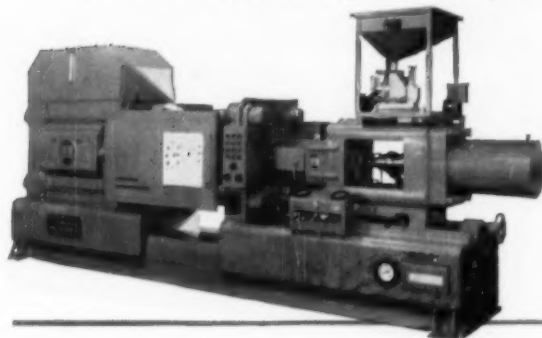
Big Area Freezer Chest Frame Molded With Ease

Minnesota Plastics Corp. reports, "Our experience with our new H-P-M 20 oz. injection machine has been very satisfactory. The construction of the machine makes for better operation and the machine seems adequate to handle parts up to its rated capacity with little or no difficulty."

You get full capacity value with the H-P-M 20/28 oz. . . parts like these normally require 32 to 48 oz. machines to obtain sufficient plasticizing capacity and mold areas to accommodate big area parts. That's why the H-P-M 20/28 oz. is your best buy. The

heating chamber is larger than those found on machines twice its size . . . injection speed far exceeds anything yet built . . . there's plenty of daylight and stroke for deep parts . . . and large platens to accommodate big molds.

The parts illustrated weigh 19.4 ozs. and have a projected area of 170 sq. in. — a difficult rectangular shape to mold. If you are molding similar parts in the 16 to 28 oz. class, you can't overlook the production advantages of this new H-P-M, Model 400-H-20/28. Write for details, today.



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Presses for Every Pressure Processing Application

NOBODY HAS AS MUCH EXPERIENCE AT MOLDING POLYETHYLENE AS

TUPPER!

The logical molder for you to consult regarding that product or package of yours which is to be made of polyethylene is Tupper. Tupper has done more than any other molder to make molded polyethylene a practical reality.

Aside from having designed, patented, and promoted successful seals, closures, and dispensers for polyethylene containers, the Tupper Corporation has vast experience in every phase of polyethylene packaging and polyethylene injection molding. This experience will be of major importance in improving your product, in reducing your costs, when Tupper goes to work for you.

Tupper's combination of experience, technical ingenuity, and the most modern equipment is at your service for the custom molding of your product in polyethylene. You can do no better than the best ...and the best at molding polyethylene is Tupper!

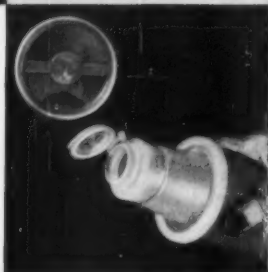
TUPPER!
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TUPPER CORPORATION

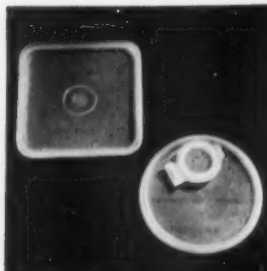
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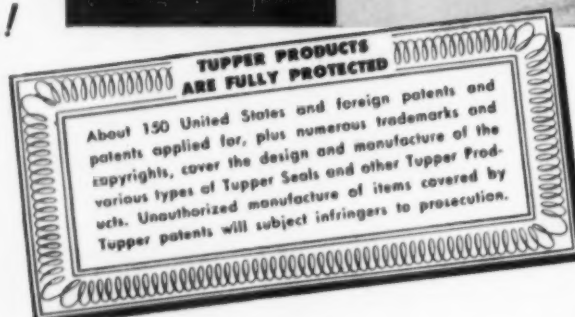
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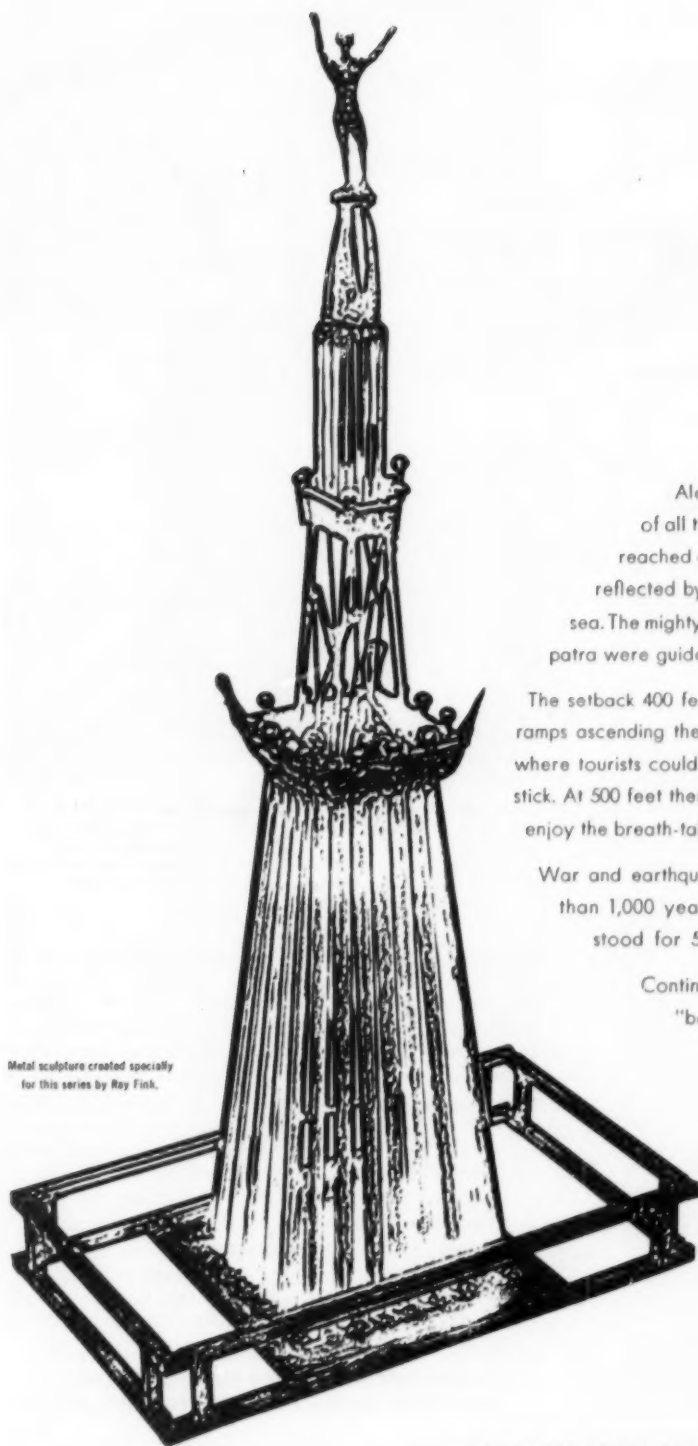


Tupper Seals are air and liquid-tight flexible covers. The famous Pour All and Per Top covers are designed for easy dispensing. They are made in sizes to fit all Tupperware containers.



When equipped with Tupper Seals, Tupper Canisters, Sauce Dishes, Wender Bowls, Cereal Bowls and Funnels in various sizes are the most versatile reusable containers you have ever seen.





Metal sculpture created specially
for this series by Roy Fink.



The seventh and last wonder of the ancient world—the towering Pharos at Alexandria—was the tallest if not the most beautiful of all the wonders. The size of a city block at the base it reached 600 feet to the top where its gleaming wood fire, reflected by a highly polished mirror, was visible 30 miles at sea. The mighty armadas and merchant ships of Caesar and Cleopatra were guided safely to port many times by this huge beacon.

The setback 400 feet up was reached by donkeys traversing broad ramps ascending the interior of the base. Here was a market-place where tourists could buy fruit and tender morsels of roast lamb on a stick. At 500 feet there was an observation platform where one could enjoy the breath-taking panorama of Alexandria and the sea beyond.

War and earthquake wrote finis to the majestic light after more than 1,000 years of continuous service. The darkened base stood for 5 centuries more before it, too, was destroyed.

Continuous service to its customers has long been a "beacon" followed by Plenco. In the laboratory and in the field Plenco engineers are continually at work assisting in the solution of plastic problems. Perhaps you have a problem that has you "at sea" . . . if you do, call or write Plenco at the address below.

You'll be glad
you did.

PLASTICS ENGINEERING COMPANY
Sheboygan, Wisconsin



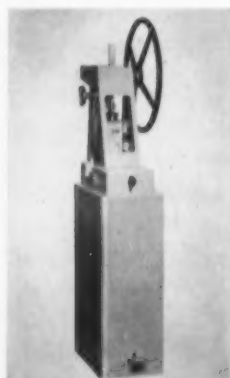
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on small jobs
with the

MINI-JECTOR

TRADE MARK

*the proven, low-cost, economical
plastic injection molding machine*

Here are the small thermoplastic injection molding machines that do a small job in a big way! Economical to operate and low in cost, these $\frac{3}{4}$ ounce plastic injection molding machines are turning out thousands of small plastic items every day for hundreds of satisfied users. Molds any thermoplastic . . . including Nylon. The Mini-Jectors are the most versatile machines in their class. Simple and compact in design, Mini-Jectors operate easily and efficiently and owners everywhere find they pay for themselves many times over.



MODEL 40, Bench model, $\frac{3}{4}$ oz. cap., complete with standard equipment, hand knockout, only \$350. **MODEL 41**, Floor model, complete with standard equipment; foot die knockout.



MODEL 50, Similar to Model 40, except it is provided with hydraulic system for injection instead of manual operation. $\frac{3}{4}$ oz. capacity, features simplified knockout arrangement.



MODEL 60, $\frac{3}{4}$ oz. injection capacity per shot. Mold size 6"x5"x5 1/2". 5.5 lbs. per hour plasticizing capacity. Molds 6 sq. in. of area. 4 lbs. capacity of material hopper. Hydraulic system for injection. Features semi-automatic knockout arrangement for fast operation and quick mold change.

MANUFACTURERS . . . The many applications of the Mini-Jector make it a popular choice of manufacturers, large or small, for developing experimental parts, field testing and pilot models. It has also served as an introduction for many manufacturers to plastic injection molding.

CUSTOM MOLDERS . . . Custom molders with large capacity molding machines find the Mini-Jector invaluable in making fast and economical running tests on new materials and in the preparation of sample parts, die try-outs, or small commercial runs.

SCHOOLS, COLLEGES, UNIVERSITIES . . . Mini-Jectors have found wide use in educational institutions of all levels in teaching the behavior and characteristics of a wide variety of thermoplastics.

**EVERY DAY THOUSANDS OF ITEMS ARE BEING
PRODUCED PROFITABLY ON THE MINI-JECTOR.**

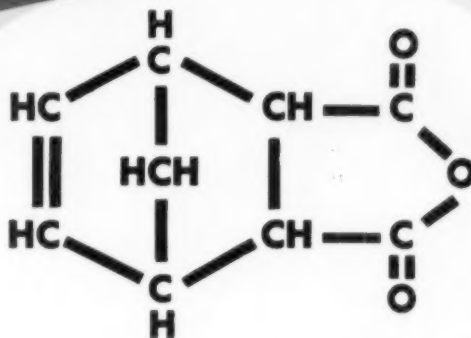
WRITE TODAY for free literature that will tell you how you can use the Mini-Jector to solve your injection molding problems.

NEWBURY INDUSTRIES

Specializing in the Production and Development of Plastic Injection Molding Machines of One Ounce or less Capacity.

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NATIONAL "NADIC" ANHYDRIDE
 for polyesters, resins, plasticizers,
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Since we announced this unique intermediate a year ago much interesting application work has been done. Its use has grown encouragingly. But the possibilities of this unsaturated dicarboxylic anhydride with a cyclic structure are far from completely explored.

Have you considered how you can capitalize upon its reactive double bonds and the many opportunities for cross linkage? We will be pleased to cooperate fully with those whose work may lead to expanded commercial use of "Nadic" Anhydride.

WRITE FOR TECHNICAL BULLETIN I-5

This 12-page digest of the properties, reactivity and suggested uses of "Nadic" Anhydride also includes a list of 68 literature references. It should be a helpful springboard to progress on current uses and future applications. A copy will be sent without cost or obligation.

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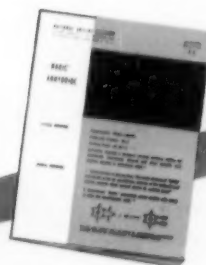


- ☐ PLEASE SEND COPY OF
 TECHNICAL BULLETIN I-5
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 SAMPLE FOR EVALUATION

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New Realism, Strength, Economy

IN MANY DIFFERENT PRODUCTS...



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Radio Cabinet



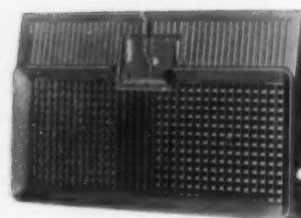
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Cheese Keeper



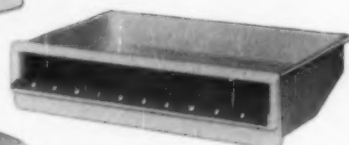
Springing Horse springs ahead in sales. Alluring, practically indestructible "DELPHOS" Black Beauty—molded by AMOS. May be seen in leading department stores and chain stores.



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► There's always room at the top for a good product made better—with AMOS engineered plastics.

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Custom Injection
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Uniform quality of "WATASEAL"[®] assured by F-B[®] calender trains

"Wataseal" vinyl film, used in the fabrication of raincoats, shower curtains, infant wear, etc., and "Wataseal" sheeting for furniture and wearing apparel are produced at Harte & Company's Long Island plant on four modern Farrel-Birmingham calender trains.

Fred S. Strauss, president of the company, states, "A fine, uniform product is turned out in a minimum period of time, with no unusual cleaning, maintenance or replacement problem for the machinery. We've never had any trouble with

this equipment, which runs at great speed under high temperature and pressure."

Each of the four lines is composed of Banbury mixer, two-roll mill, and four-roll "Z" or inverted "L" calender, matched in capacity for smooth, continuous production flow. Each line is capable of producing up to 100 yards per minute of finished material—plain or embossed.

Mr. Strauss goes on: "When it comes to that type of machinery, the name Farrel-Birmingham is just like Tiffany's. We first went to them be-

cause of their fine reputation and we have never been disappointed with the equipment."

Are you interested in improving processing efficiency, or the quality of your finished product? Then, get in touch with Farrel-Birmingham. In the meantime, send for information on F-B processing equipment.

FARREL-BIRMINGHAM COMPANY, INC.

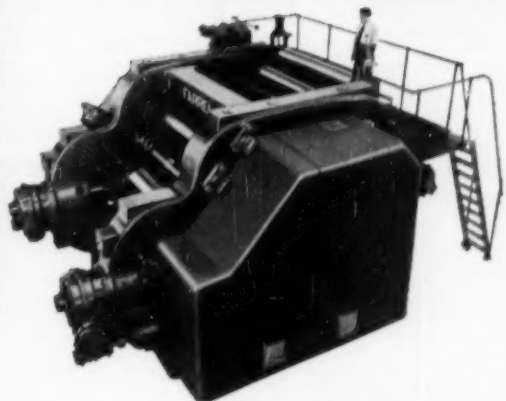
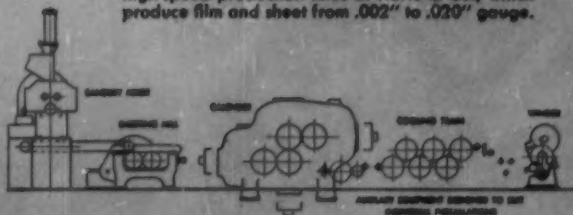
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Setup similar to that of the four Farrel-Birmingham high-speed production lines at Harte & Co., which produce film and sheet from .002" to .020" gauge.



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Banbury Mixers • Roll Mills • Calenders • Extruders •
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Optimum uniformity of material
and granulation provides
uniform low-cost molding operations

Uniformity—it's the key to good molding—but until today you've had to pay a premium price for specially processed polyethylene for optimum uniformity.

Now, with Dow's new polyethylene, you get optimum uniformity at *no extra cost*.

- *Uniformity of material* . . . Dow's process gives uniform molecular weight distribution and uniform physical properties.
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designed to give you
premium uniformity
without premium cost



Add these together and you have uniform operating conditions that cut your molding costs. Now you can have this profitable combination . . . premium uniformity of material that makes low-cost uniformity of operation . . . in Dow Polyethylene without paying extra price.

You have another big plus in dealing with Dow for your polyethylene requirements. You will find the finest cus-

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To help you find that just-right plant site . . .

Every day we measure the growth of 2319 communities

in Michigan, Indiana, Ohio, Kentucky,
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THE RESULT . . . a perpetual inventory of plant-site information about a 45,000-square-mile territory where a large number of chemical plants provide a bountiful supply of raw material for plastics manufacture. This data is unequalled in up-to-the-minute accuracy and completeness.

For nearly fifty years, the American Gas and Electric System has served practically every home and business in

this growing seven-great-state area that now includes 2319 towns.

Our men are in these communities every day, every week of the year—a network of on-the-job personnel carefully reporting changes of economic and social import.

Whether your need is dispersion, decentralization or expansion, the American Gas and Electric Company can help simplify your plant-site selection prob-

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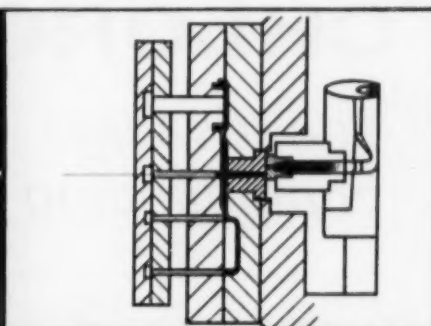
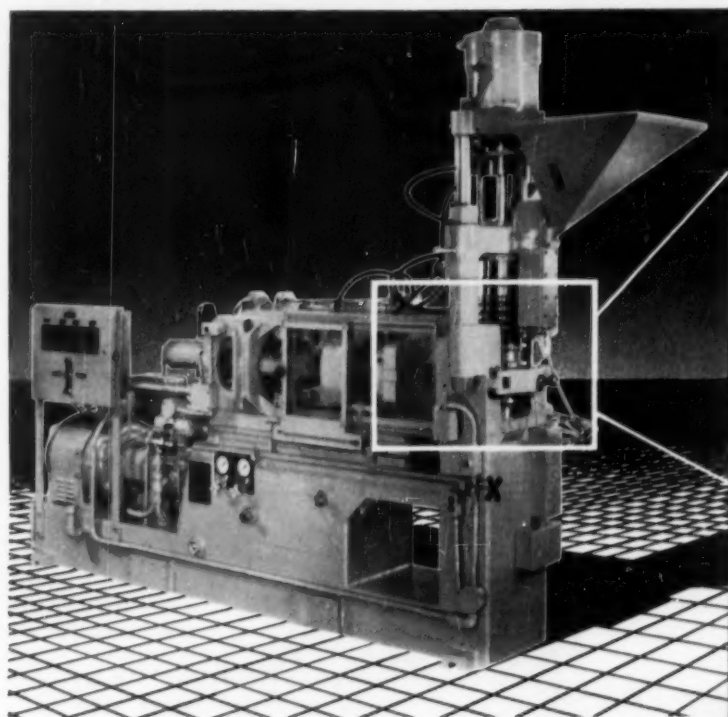
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To get a more detailed description of the many industry advantages in the American Gas and Electric service area, write for the brochure "A 7-State-Plant-Site Trip—in 5 minutes."

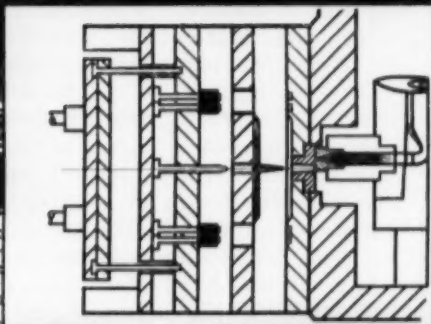
You'll learn about water, transportation, labor, taxes, raw materials, education, community character and atmosphere and many other data necessary for pleasant, profitable plant operation. Address your inquiry in confidence to Mr. Lee Davis, Manager Area Development, 30 Church Street, New York 8, New York.



Exclusive CUT-OFF ATTACHMENT means Foolproof LESTER-AUTOMATIC MOLDING



SPRUE SHEARING ON TUNNEL GATED MOLD



SPRUE SHEARING ON 3-PLATE MOLD

The big plus feature of the L-1/2-4 oz. LESTER-AUTOMATIC is the sprue shearing attachment. It cuts the sprue and string *before* the mold opens. Every other machine wastes valuable cycle time by shearing after the mold opens. The cut-off attachment allows the greatest range of mold design, including sprueless hot runner, tunnel gated or 3-plate molds.

Other features that make the L-1/2-4 oz. Lester superb for automatic molding are:

1. Positive pneumatic mold wiping (optional). Rigidly mounted to the solid steel frame, insuring minimum lost time for mold clearing and minimum

part loss from scattering.

2. Automatic recycling with adjustable time delay for mold clearing.

3. Fail-safe low pressure mold closing circuit which combines full-speed mold closing with low clamping pressure until the die faces meet.

This self-contained machine is in operation, individually or in batteries, tended by only one operator. Our technically trained sales representatives will be happy to give you the details on these and other exclusive Lester features for automatic molding.



LESTER INJECTION MOLDING MACHINES

REPRESENTATIVES

New York Steven F. Krould
Detroit M. R. Tenenbaum
Chicago J. J. Schmidt
Cleveland Don Williams
Coral Gables Morton Machinery Sales

Cincinnati Index Machinery Corp.
Los Angeles Machinery Sales Co.
St. Louis, Milwaukee A. B. Geers
Providence Sydney W. Lohman

FOREIGN

Toronto, Canada Modern Tool Works, Ltd.
Sydney, Australia Scott & Holladay, Ltd.
Japan Okura & Co., New York, Inc.
Stockholm, Sweden Aktiebolaget Servus
Basle, Switzerland Hermann Walti

distributed by LESTER-PHOENIX, INC., 2621-R CHURCH AVENUE • CLEVELAND 13, OHIO

NEW, LOW-VISCOSITY CHLOROWAX®

*speeds vinyl
compounding*

Now, DIAMOND's new, low-viscosity secondary plasticizer . . . CHLOROWAX LV . . . offers vinyl processors another way to reduce costs and improve quality. CHLOROWAX LV can give you all the advantages of Chlorowax 40, plus additional ease in handling and faster blending.

Viscosity of CHLOROWAX LV falls in the five poise range at 25° C.—a substantial drop from the 20- 40 poise range of normal 40% chlorinated paraffins. Viscosity of CHLOROWAX LV approaches that of commonly employed primary plasticizers. Plant handling is speeded because of greater flow rates.

Better fluidity tends to give flexible plastics better physical characteristics at low temperatures and is an added advantage in plastisol formulations requiring fluidity.

Greater stability of CHLOROWAX LV is important when processing heat is required and results in products with better stability and aging characteristics.

For information or technical co-operation in the use of CHLOROWAX LV or any other CHLOROWAX product (CHLOROWAX 40, 50, 70 and 70-S), write DIAMOND ALKALI COMPANY, Chlorinated Products Division, 300 Union Commerce Building, Cleveland 14, Ohio.



Notice how readily CHLOROWAX LV pours at room temperature. Can this speed handling and blending in your plant?

CHARACTERISTICS OF CHLOROWAX LV

| | |
|----------------------------------|---------------|
| Specific Gravity | 1.13 |
| Weight—Pounds Per Gallon | 9.4 |
| Viscosity—Poises 25°C. | 5.1 |
| Viscosity—S.U.S. 100°F. | 902 |
| Viscosity—S.U.S. 210°F. | 70 |
| Chlorine—Per cent | 40 |
| Solubility in Water | None |
| Toxicity | Non-Toxic |
| Odor | None |
| Flammability | Non-Flammable |



Diamond Chemicals

DIAMOND CHEMICALS

SALES OFFICES: New York, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, St. Louis, Memphis, Houston.

DIAMOND DISTRIBUTORS: Dorsett & Jackson, Inc., Los Angeles; Carmona & Hawhurst, Inc., San Francisco; Van Waters and Rogers, Inc., Seattle and Portland, U. S. A.; Harrisons & Crosfield (Canada) Ltd.

Increased operating efficiency; lower operating costs with mixer on **TIMKEN®** bearings

HERE are the reasons Stewart Bolling & Company, Inc., Cleveland, uses Timken® tapered roller bearings in the split end frame housings of its intensive plastic and rubber mixers:

Timken bearings do away with extra thrust devices that cause power loss through friction. Because of their tapered design, the Timken bearings can withstand the continually changing rotor end thrust as well as the radial

loads. Rotor end-play is eliminated.

Timken bearings also maintain true centers within very minute limits, maintaining established clearances between rotors. Gears operate indefinitely on their original pitch lines, greatly reducing gear wear and replacement.

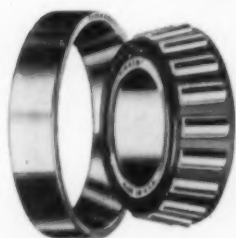
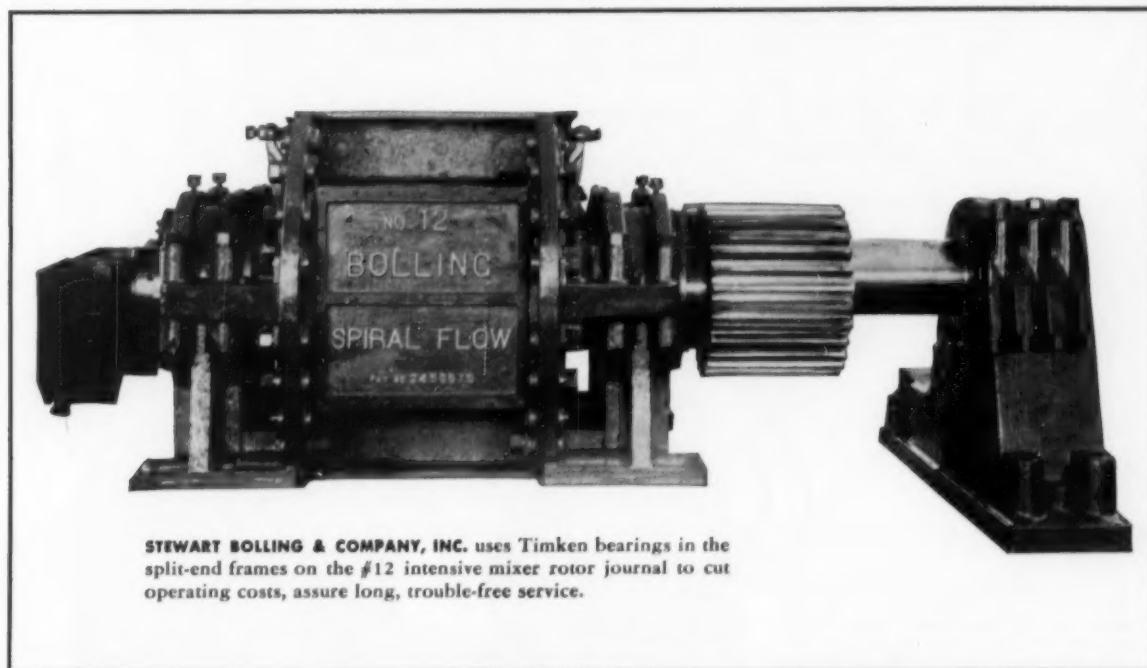
And Timken bearings, themselves, last and last because rollers and races are case-hardened to give them hard, wear-resistant surfaces over tough, shock-resistant cores.

Overall result: Higher mixing speeds, improved performance, lower maintenance cost, less downtime and lower operating cost per pound.

Look for the trade-mark "Timken" stamped on every bearing to get these same advantages on your machinery. The Timken Roller Bearing Company, Canton 6, Ohio. Canadian plant: St. Thomas, Ontario. Cable address: "TIMROSCO".



This symbol on a product means its bearings are the best.



TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
TAPERED ROLLER BEARINGS

OUR OWN NICKEL-RICH ALLOY STEEL MAKES TIMKEN BEARINGS TOUGHER

Nickel makes steel tougher. And we don't skimp on nickel in the fine alloy steel we make for Timken bearings. Our steel-making specialists use the exact amount to give Timken bearings the toughness they need to withstand shock, last longer. We control the quality of Timken bearings at every step in production—from melt shop through final bearing inspection.

NOT JUST A BALL NOT JUST A ROLLER THE TIMKEN TAPERED ROLLER BEARING TAKES RADIAL AND THRUST LOADS OR ANY COMBINATION

Comparison proves

the Fellows "6-200" leads the field!



CAPACITY—The "6-200" is the fastest fully automatic FULL 6 OUNCE machine on the market! "Pre-Pack and Pre-Positioned" device (optional) brings plunger halfway forward during press dwell... providing up to 8 OUNCE "SHOTS."



SPEED—Thanks to such features as variable stroke adjustment, rapid advance injection, and new, improved Speed-Flo heating cylinder... the "6-200" delivers "dry-run" speeds from 490 to 650 cycles per hour.



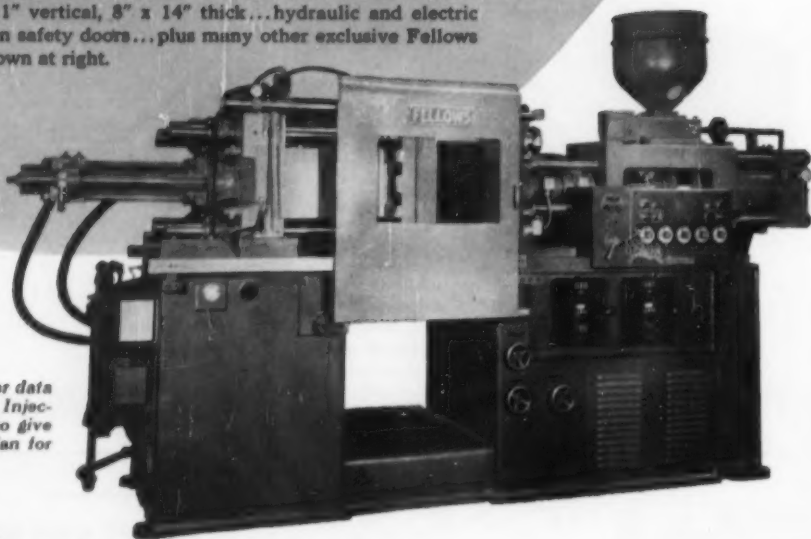
FULLY AUTOMATIC—Only the "6-200" gives you all the automatic features which allow one man to operate three or more machines! Grouped built-in temperature, injection pressure and speed controls! Counter, air-blast connections, alarm timer and safety device for mold... as extra equipment!



EASY SET-UP—Entire press hydraulically retracts from nozzle for purging... plenty of open space on all sides of die platen... mold opens 6 to 9 inches... single control clamping adjustment.



BONUS FEATURES—The "6-200" takes 12" x 24" molds horizontal, 15" x 21" vertical, 8" x 14" thick... hydraulic and electric interlocks on safety doors... plus many other exclusive Fellows features, shown at right.



ASK your Fellows Representative for data about the complete line of Fellows Injection Molding Machines. He can also give you information on the Fellows Plan for deferred payment.

Fellows

injection molding equipment

THE FELLOWS GEAR SHAPER COMPANY, Plastics Machine Division, Head Office and Export Department, Springfield, Vermont
Branch Offices: 319 Fisher Building, Detroit 2 • 5835 West North Avenue, Chicago 39 • 2206 Empire State Building, New York 1
6214 West Manchester Avenue, Los Angeles 45

The DOP color standards



of the industry have been—and are—



those established by Eastman

Before Eastman began production of dioctyl phthalate the accepted industry color standard was 300 APHA.

The first Eastman specifications in 1948 called for production of a 100 APHA dioctyl phthalate. Then in 1950, this was lowered to 50... and in 1954, to only 25.

Eastman has led the way in the steady improvement of DOP quality. New production and refining methods

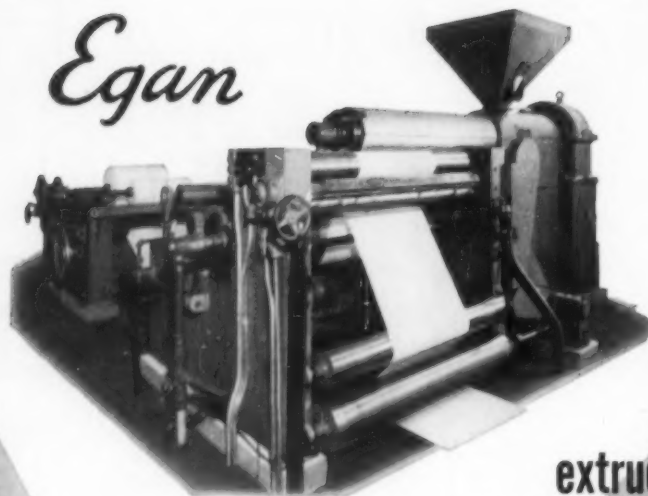
have produced in today's Eastman DOP a truly high quality dioctyl phthalate whose combination of low color, low odor, low acidity, high heat stability and high ester content is unsurpassed.

We invite you to test the high quality of Eastman DOP in your own laboratory or in your own formulations. Write for specifications and sample quantities.

SALES OFFICES: Eastman Chemical Products, Inc., Kingsport, Tenn.; New York—260 Madison Ave.; Framingham, Mass.—65 Concord St.; Cincinnati—Carew Tower; Cleveland—Terminal Tower Bldg.; Chicago—360 N. Michigan Ave.; Houston—412 Main St.; St. Louis—Continental Bldg. **West Coast:** Wilson Meyer Co., San Francisco—333 Montgomery St.; Los Angeles—4800 District Blvd.; Portland—520 S. W. Sixth Ave.; Salt Lake City—73 S. Main St.; Seattle—821 Second Ave.

Eastman
CHEMICAL PRODUCTS, INC.
KINGSPORT, TENNESSEE
subsidiary of EASTMAN KODAK COMPANY

Egan



polyethylene extruder-laminator

(Above pictured installation at the Milford, N. J. plant of
RIEDEL PAPER CORPORATION)

COMPLETE PACKAGED MACHINE

Combining in one unit, in engineered balance, two famous units—The Egan Extruder and the Egan Laminator. Planned for your current—or expanding—production, available in varying sizes—from 24" Pilot Plant Size to 96", 1000 feet per minute continuous operation. Machines are capable of coating on paper and paperboard, cellophane, foil, glassine and cloth.



35

~~30~~

Egan machines now in operation.

9

Egan machines under construction.
Approximately 75% of all polyethylene
laminating machines now in
operation anywhere in the world are
Egan Equipment.



FRANK W. EGAN & COMPANY, Somerville, New Jersey

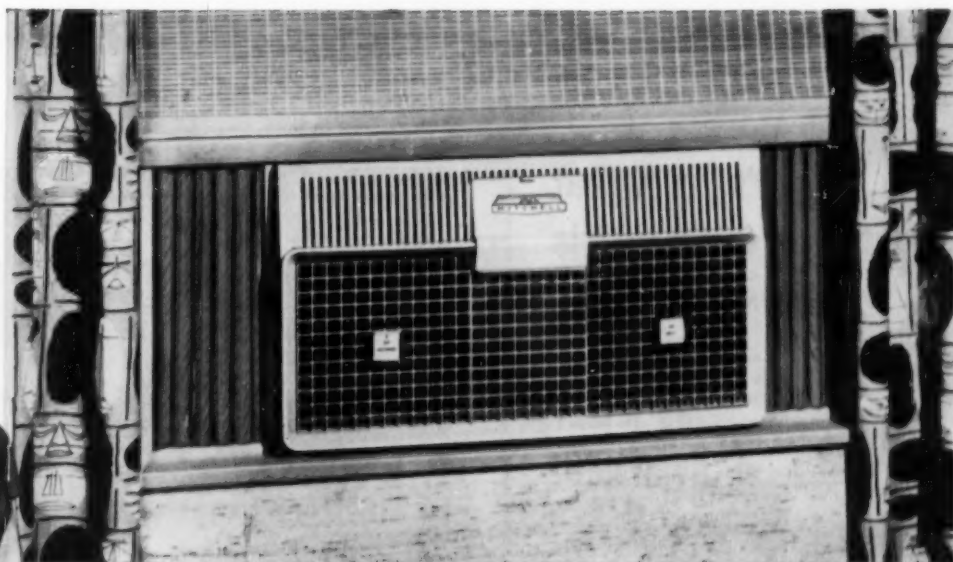
Designers and Builders of Machinery for the Paper Converting and Plastics Industries

Cable Address: EGANCO—SOMERVILLE (N.J.)

Representatives: WEST COAST — John V. Roslund, 244 Pacific Bldg., Portland, Ore.

MEXICO, D. F. — M. H. Gottfried, Avenida 16 De Septiembre, No. 10.

Licenses: GREAT BRITAIN — Bone Bros. Ltd., Wembley, Middlesex. FRANCE — Achard-Picard, Remy & Cie, 36 Rue d'Enghien Xe, Paris. ITALY — Emanuel & Ing. Leo Campagnano, Via Borromei 1 B/7, Milano. GERMANY — ER-WE-PA, Erkrath, bei Düsseldorf.



*Vinyl plastic electronically
welded by **THERMATRON**
gives a "decorator" look
to air conditioning installation*

Smart, attractive and practical—that describes the new Expando-Mount plastic window filler designed for use with the Mitchell room air conditioner. Permanently sealed by THERMATRON, this plastic closure fits any window, blocking off outside air, adding a decorator touch to the room.

THERMATRON was the ideal choice for this job because electronically welded plastic is airtight and watertight with no bothersome stitching or perforations.

Expando-Mount is just one example of the way THERMATRON equipment makes possible the economical manufacture of hundreds of diversified plastic items. Write or call us today for tests on your own material without obligation . . . and ask for our comprehensive bulletin no. 97.

Expando-Mount is welded for Mitchell by Adorn Plastic Welding Co. and Serabee Manufacturing Co., both of Chicago, on special automatic Thermatron P-16 presses, each equipped with a K250 25 KW generator and arc suppressor. Standard Thermatron models available from 1/4 KW to 25 KW weld vinyl from .002" up to .080" serving most requirements.



Thermatron Division

RADIO RECEPTOR COMPANY, INC.

Thermatron

In Radio and Electronics Since 1922

SALES OFFICES: 251 West 19th St., New York 11, N. Y. WATKINS 4-3633
Chicago: 2753 West North Ave.

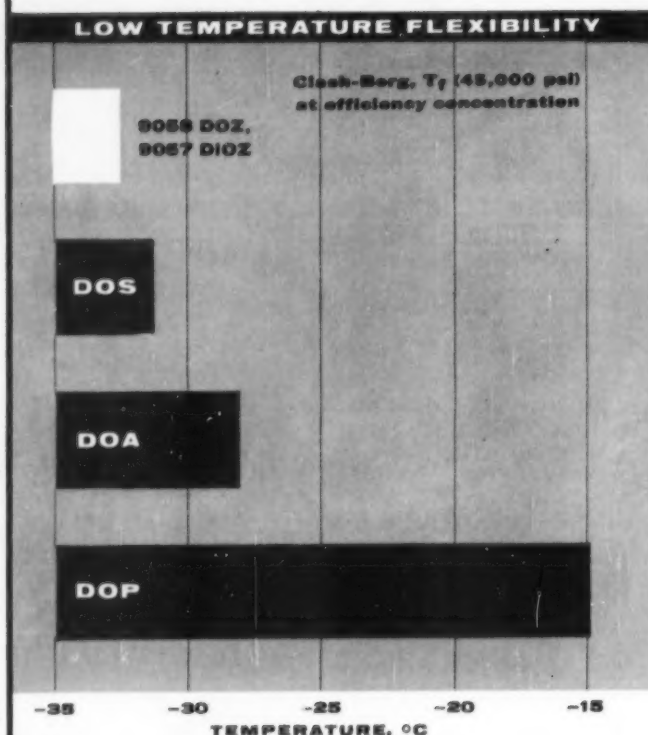
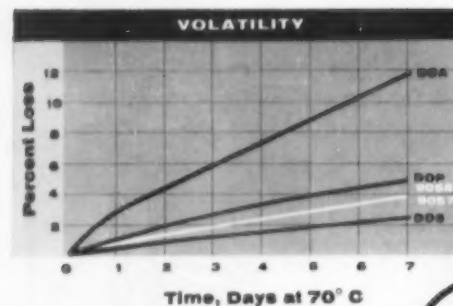
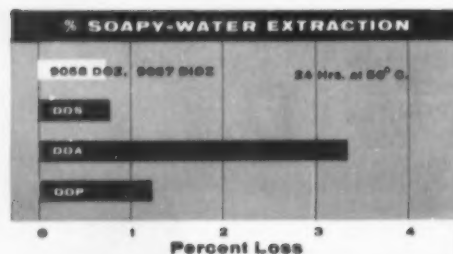
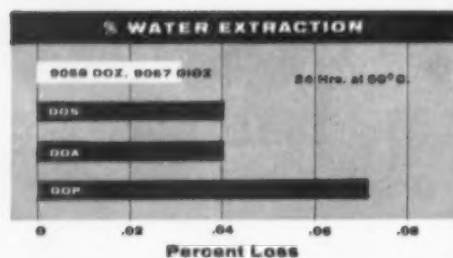
Los Angeles: Electro Seal Plastics Co., 130 North Juanita Ave.

Factories in Brooklyn, N.Y.

OTHER RADIO RECEPTOR PRODUCTS: Communications, Radar and Navigation Equipment; Selenium Rectifiers; Germanium Transistors, Germanium and Silicon Diodes

DOZ gives you low-temperature flex—PLUS!

Here's proof that
Plastolein® 9058 DOZ is
the best all-around
low-temperature
plasticizer
available!



When a plasticizer does *many* things well, it is reasonable to expect product improvement, lower costs and increased profits. That's exactly what happens when you use Plastolein 9058 DOZ or its companion product, Plastolein 9057 DIOZ. As the charts illustrate, both impart unexcelled low-temperature flexibility, *and at the same time* provide low volatility, low water extraction, and low soapy-water extraction. In addition, they possess excellent resistance to heat and light, provide low-viscosity dispersions, and impart excellent drape to film and sheeting.

When you put all of these features into your calendered and cast films, calendered sheeting, calendered and dispersion coated fabrics, fabricators of finished goods will be more receptive to your products, will reorder time after time. That's why you should use Plastoleins 9058 DOZ or 9057 DIOZ. Write Dept. F-9 for descriptive literature or evaluation samples, today.



Emery Industries, Inc., Carew Tower, Cincinnati 2, Ohio

Fatty Acids & Derivatives
Plastolein Plasticizers
Twitchell Oils, Emulsifiers

New York • Philadelphia • Lowell, Mass. • Chicago • San Francisco • Cleveland

Warehouse stocks also in St. Louis, Buffalo, Baltimore and Los Angeles

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5-ton mold of CRUCIBLE CSM 2 produces butyrate hobby horse

Five tons of Crucible CSM 2 mold steel went into this two-cavity mold built by the Enduro Tool and Engraving Company, for Wonder Products, manufacturers of a new plastic hobby horse. Body of the horse, injection molded by Ger-Ell Manufacturing Company, is made of $5\frac{1}{2}$ pounds of medium-flow ivory butyrate, in a mold measuring 40 x 18 x 55 inches, and weighing over 10,000 pounds.

It's with good reason that Crucible mold steels are specified for the big jobs. Made by the electric furnace process in the country's largest tool steel mill, Crucible mold steels actually *are* tool steels. And because they are tool steels you can be sure of uniformly high quality from piece to piece.

So, no matter how large or small your next job may be — call Crucible for your mold steel needs.

CRUCIBLE

first name in special purpose steels

54 years of *Fine* steelmaking

MOLD STEELS

CRUCIBLE STEEL COMPANY OF AMERICA • TOOL STEEL SALES • SYRACUSE, N. Y.

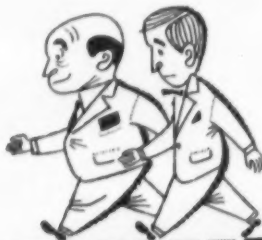
What's the name of that wonderful molder?



"Button... Booty... something like that. One thing I remember — they do compression and injection custom molding. And what moldings! Terrific!"



"One they made for us recently is a beauty. Engineered just right, you know. And it should be. They worked with our staff 'till they were sure the design was perfect."

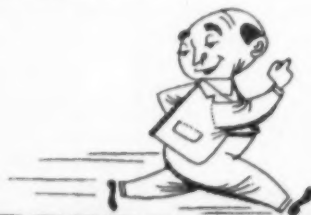


"Gee, this is embarrassing. I know everything else about them: they're about 35 years in business, make top quality moldings, charge reasonable prices, give really fast deliveries..."

"And the mold they laid out! Ingenious, beautifully made, delivered on time — you can see how good their equipment and personnel must be. If only I could remember their name!"



"Say! There it is! That's the name!"



"B-O-O-N-T-O-N —"



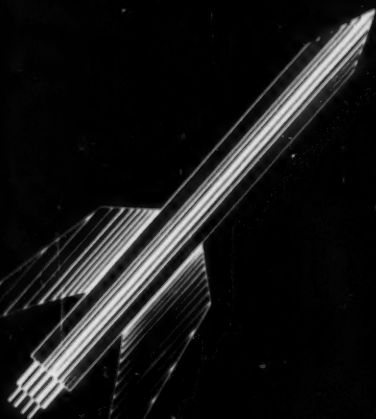
"BOONTON! OF COURSE!"



BOONTON MOLDING CO.

BOONTON, NEW JERSEY

NEW YORK OFFICE — CHANIN BUILDING, 122 EAST 42ND STREET, OXFORD 7-0155



TOPS

in Pigment Scarlets

Ours is not an exaggerated claim — we are undisputedly the world's largest producer of the finest Pigment Scarlets ever developed for use as a colorant or printing ink!

*738-564 PIGMENT SCARLET TONER (formerly 25 AD) is featured as the color in this ad.

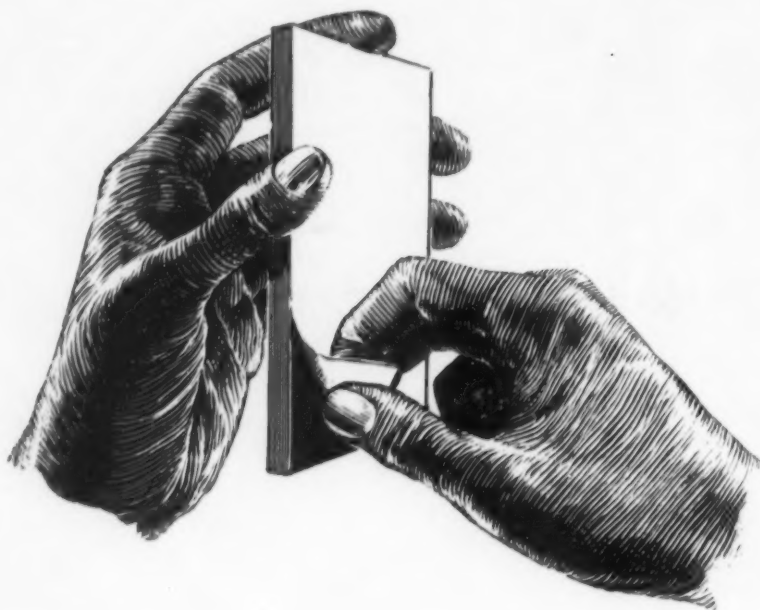
for further information or samples — write or phone.

Zinsser & Company, Incorporated

subsidiary of THE HARSHAW CHEMICAL COMPANY **HASTINGS-ON-HUDSON, NEW YORK**

CHICAGO: Edward J. Lewis Co.

CLEVELAND: The Dimlich Radcliffe Co.



hands you never see
give *your pressure sensitive cement*
the test that really counts

Got a product that requires mechanical or adhesive installations or applications? Then by all means explore the possibilities of new *pressure sensitive cements*! But remember this:

Hands you never see . . . the hands of the eventual product user . . . give your pressure sensitive cement the test that really counts. So look for *experience* with this new adhesive medium . . . experience that goes beyond the laboratory into the field of use.

As adhesive manufacturers for over 20 years, and pioneers in the pressure sensitive field, we already have some unusual success stories to tell. Let's talk about how they might be applied to your product.

Call or write Dept. A at the nearest Angier Plant for personal attention. We will help you define your problem as well as solve it. Inquiring will not obligate you in any way.

**FOR EVERY
INDUSTRY**

Latest Developments
in Pressure Sensitive
Cements



Rubber, Latex and
Resin Cements
Laminants and Sealants
Tie Coats
Resin Emulsions

Angier Products

120 POTTER STREET, CAMBRIDGE 42, MASS.

Midwestern Plant: Huntington, Indiana

© 1955 Angier Products, Inc.



For PLASTICS — WORBLA

Manufacturers of plastics for over thirty years.

WORBLA-PLASTICS have proved their worth

So that you may see for yourself — we shall gladly provide you with samples.



— Celluloid in sheets, tubes and rods.



— Cellulose Acetate in sheets, tubes and rods.



— Acetate powder for injection moulding and extrusion.



— PVC (Polyvinylchloride) in calandered and pressed foils and sheets, tubes, rods and profiles. Compounds for injection moulding and extrusion.

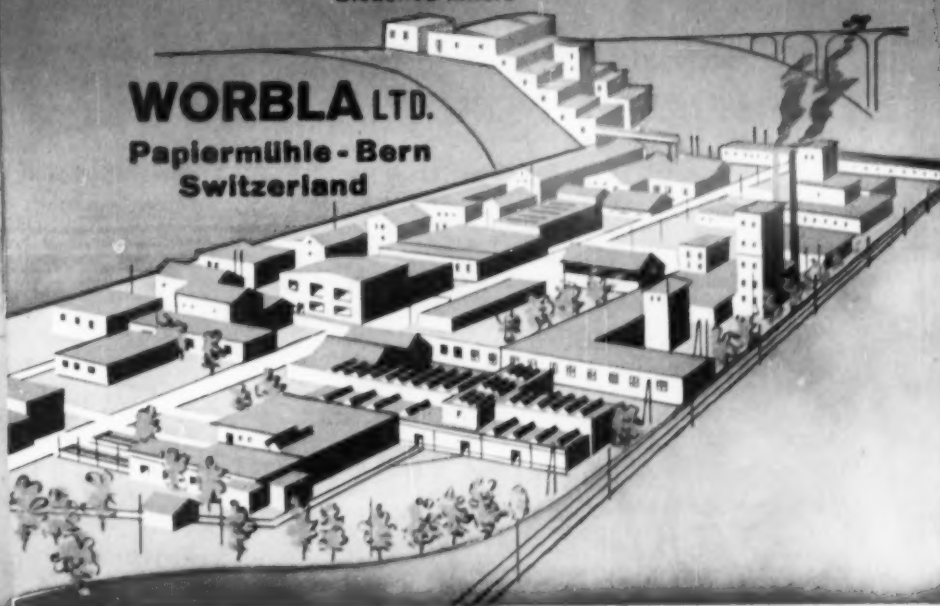


— Nitrocellulose for lacquers and technical uses.

Bleached linters

WORBLA LTD.

Papiermühle - Bern
Switzerland



**We help
keep your
products
moving!**



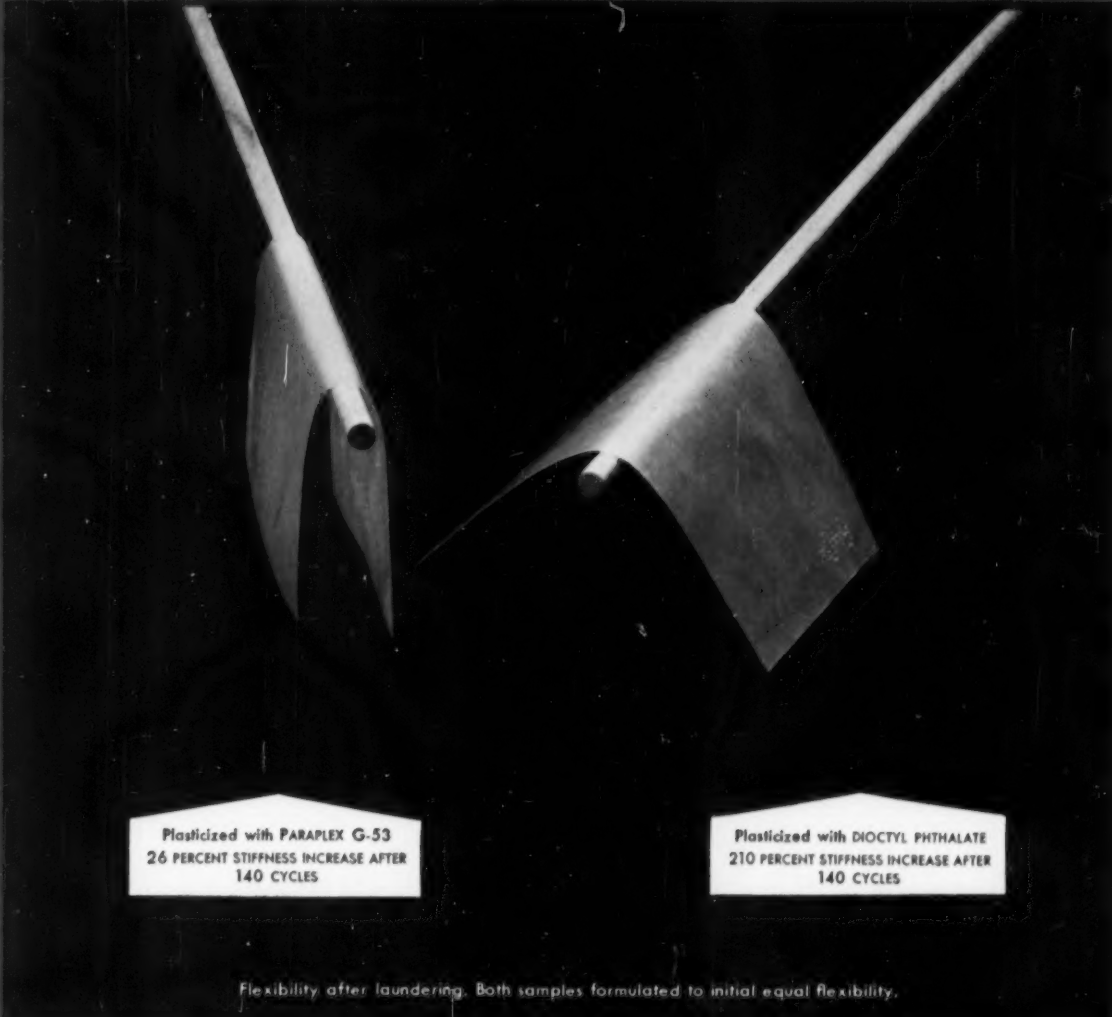
**Specialized Bridgeport Techniques mold your products better,
more economically . . . *speed them to market faster!***

Bridgeport slashes ordinary time and labor-consuming steps in assembly, finishing, spraying, drying and other secondary operations of plastic molding. Special tools and techniques improve overall efficiency. Your products *move faster to market at less cost!* Write today for full details.



BRIDGEPORT MOULDED PRODUCTS, INC.

BOX 3276, BARNUM STATION, BRIDGEPORT 5, CONN.



Plasticized with PARAPLEX G-53
26 PERCENT STIFFNESS INCREASE AFTER
140 CYCLES

Plasticized with DIOCTYL PHTHALATE
210 PERCENT STIFFNESS INCREASE AFTER
140 CYCLES

Flexibility after laundering. Both samples formulated to initial equal flexibility.

Watch out for plasticizers that wash out

Washing vinyl products like baby pants or hospital sheeting in hot, soapy water can be pretty tough on the vinyl plasticizer. Tough on an ordinary plasticizer, that is. PARAPLEX G-53 doesn't mind this kind of treatment. For example, samples of vinyl film containing PARAPLEX G-53 and samples containing dioctyl phthalate were laundered repeatedly in an automatic washer together with family wash. The films plasticized with PARAPLEX G-53 remained soft and supple; the others became hard and rigid.

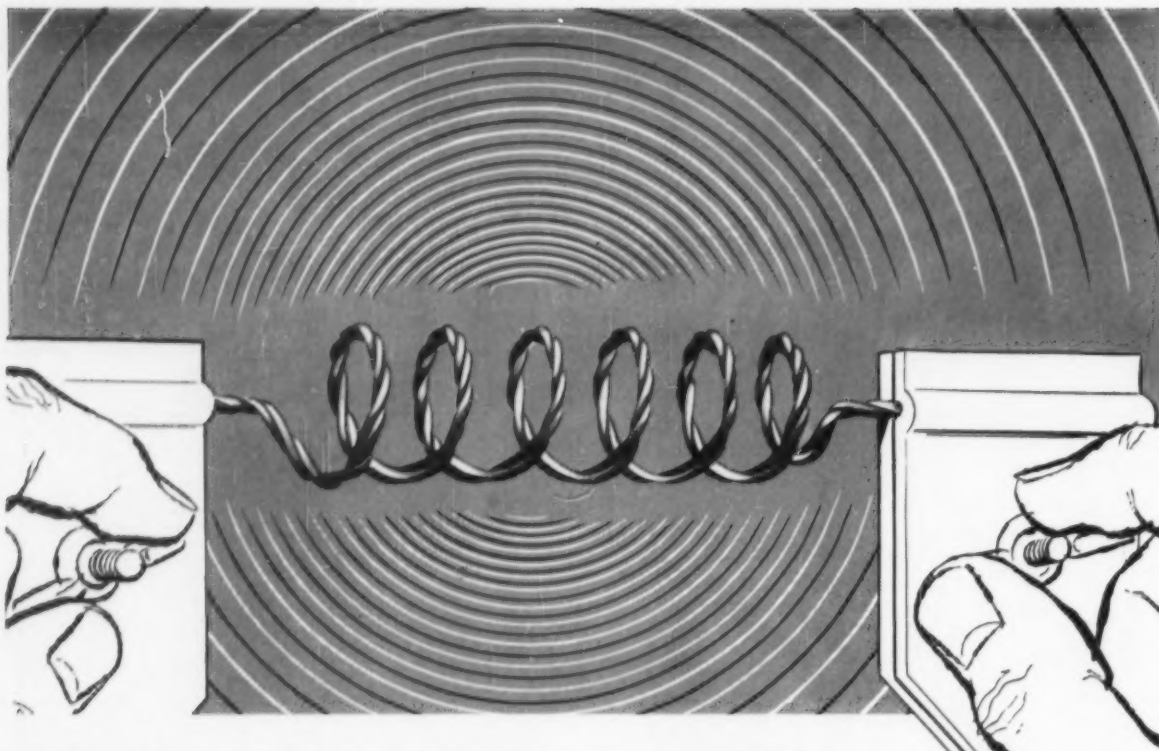
This ability to stay put under actual washing conditions is just one feature of PARAPLEX G-53 polymeric plasticizer. When you add to that the plasticizer's resistance to extraction by aromatic and aliphatic solvents, you've got quite a combination. And what's more—PARAPLEX G-53

rebels against migration into lacquer, polystyrene, rubber, and baked finishes.

Ask for *What You Should Know about PARAPLEX and MONOPLEX Plasticizers*, a handy summary of properties and uses.

PARAPLEX and MONOPLEX are trademarks, Reg. U. S. Pat. Off. and in principal foreign countries.





**Developed especially for vacuum metalizing
to give you top performance at minimum cost!**

New Process SYLVANIA TUNGSTEN COILS and STRAND

To help you get more shots per dollar in vacuum metalizing, New Process Sylvania source heater materials are produced under exacting standards of uniformity throughout every step of manufacture. From tungsten ore to finished coils and strand, every production operation is done in Sylvania's own plants.

Special tungsten wire is coiled specifically for vacuum metalizing to assure both maximum evaporating capacity and long service life. Sylvania offers you a wide selection of ready-made tungsten coils, in single or multiple strand, each designed for a specific metalizing application.

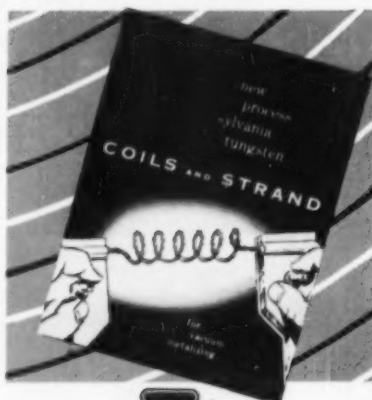
If you prefer to form your own source heater coils, there are a full range of wire diameters and types to choose from. Whenever you encounter special application problems, our engineers will gladly help you work them out. Write for your copy of the newly published "New Process Sylvania Tungsten Coils and Strand," presenting latest application and performance data.

SYLVANIA ELECTRIC PRODUCTS INC.
1740 Broadway, New York 19, N. Y.

In Canada:

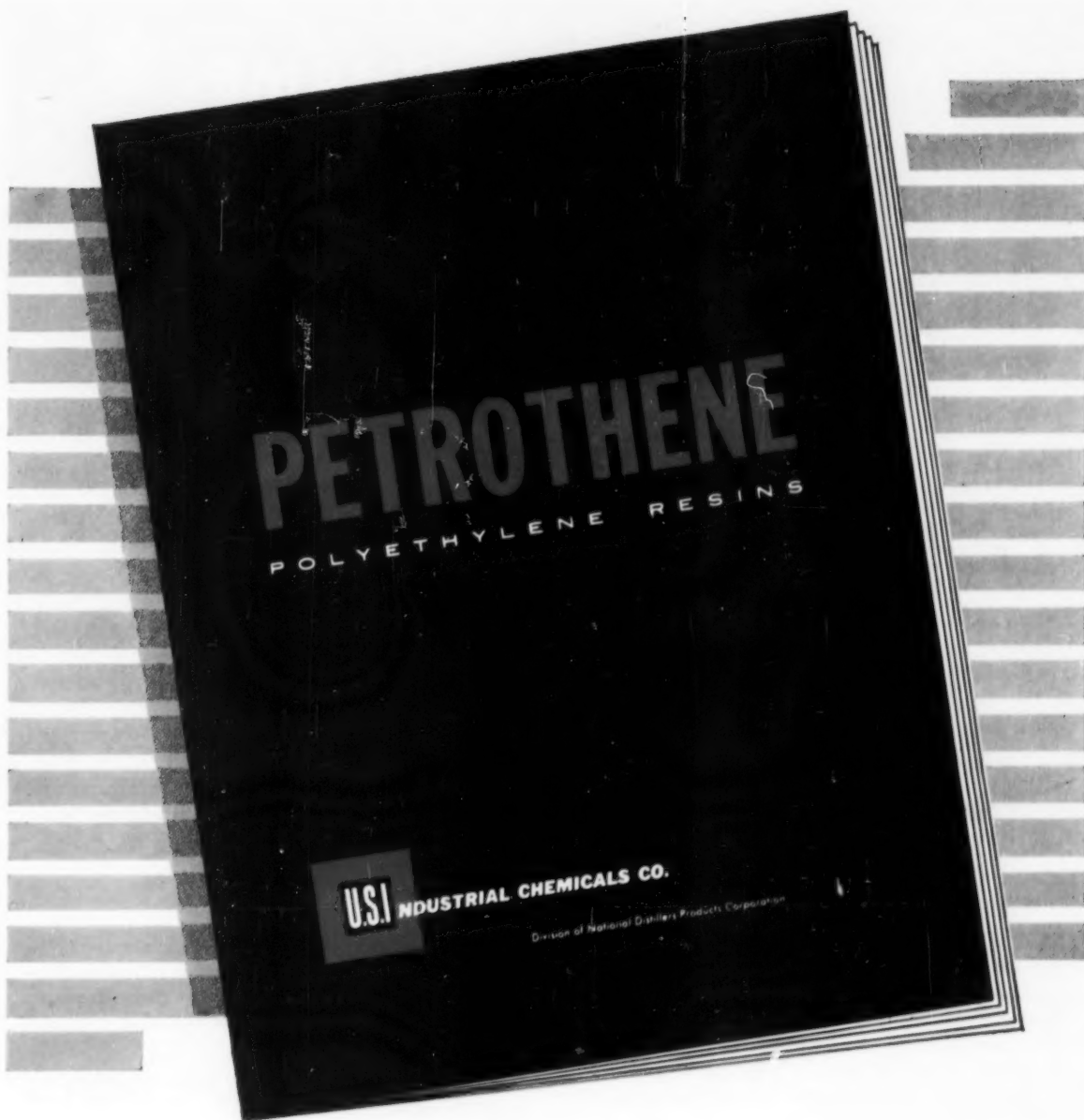
Sylvania Electric (Canada) Ltd.,
University Tower Bldg.,
St. Catherine St., Montreal, P. Q.

WRITE FOR NEW BOOKLET TODAY



SYLVANIA

Lighting • Radio • Electronics • Television • Atomic Energy



This new booklet is for the polyethylene processor interested in high-quality molding and extrusion resins.

It tells why the PETROTHENE* production facilities can give him a resin with melt index and other physical properties more consistent than that of any molding and extrusion resin available up to now. It also gives description, preparation, properties, uses, methods of processing and U.S.I. services.

For your copy, tear off the coupon and send it in.

*Trade Mark

U. S. INDUSTRIAL CHEMICALS CO.

Division of National Distillers Products Corporation
99 Park Avenue, New York 16, N. Y.

Please send me a copy of your new brochure "PETROTHENE Polyethylene Resins."

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

☐ Molder, Injection

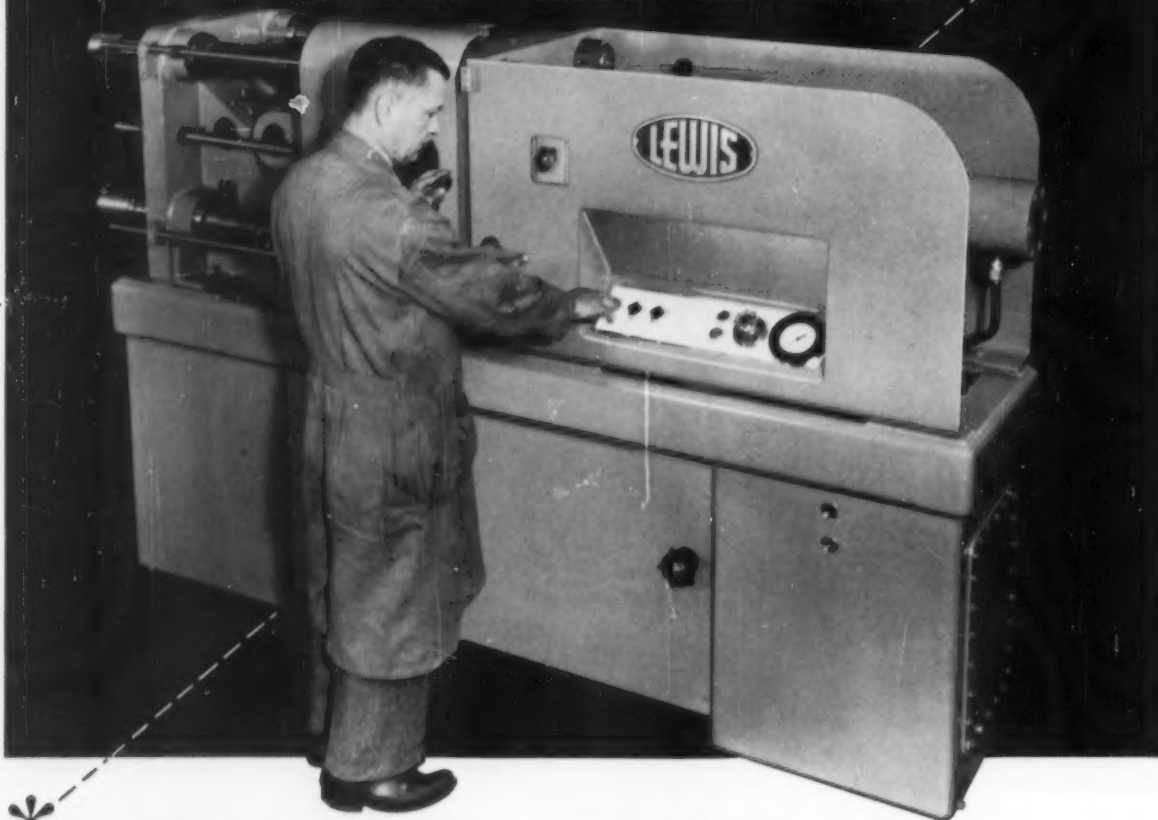
☐ Extruder, film

☐ Molder, Compression

☐ Extruder, Other

☐ Other _____

Meet the NEW CHAMP!



* the IMPROVED fully automatic LEWIS "4"

New automatic operation . . . new capacity . . . new controls . . . new power plant . . . and new production savings are *standard* features of the improved Model "4".

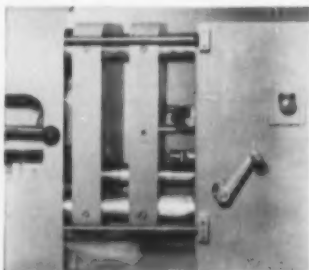
This fast-operating LEWIS machine molds up to 4 ounces of polystyrene . . . permits "hands off" production of intricate parts . . . requires minimum maintenance.

Super-sensitive low-pressure closing controls assure complete safety for operators and molds. Featuring

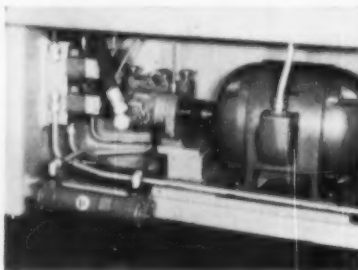
infinitely variable adjustment, these controls permit fast closure of moving platen with very low hydraulic pressure . . . stop machine instantly if platen meets slightest resistance before reaching a pre-set limit switch.

FOR COMPLETE DETAILS, WRITE FOR NEW BULLETIN 104 . . . or call Bedford 2-2500.

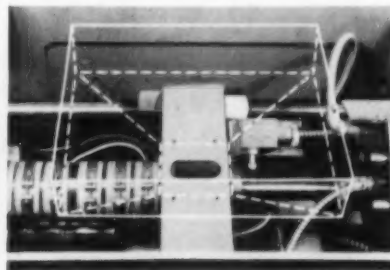
THE LEWIS WELDING & ENGINEERING CORPORATION
11 Interstate St., Bedford, Ohio



QUICK-OPENING DIE-LOCK DEVICE permits clearing of jammed nozzle in 20 seconds or less.



20,000-LB. INJECTION PRESSURES are developed by new 10 H.P. motor and new larger pump.



COMPENSATING FEED MECHANISM meters material to meet varying production requirements.

Now – You can dissolve high molecular weight polyvinyl chlorides at room temperatures

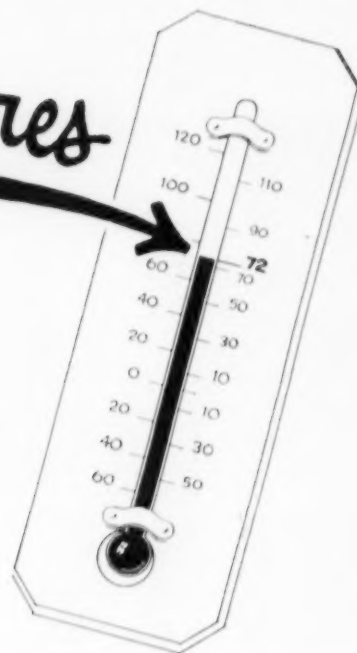
Du Pont TETRAHYDROFURAN
gives high solids content
at practical working viscosities

Tetrahydrofuran (THF) may be the key to a new or better selling product for you.

Here's an example. Adhesives made possible with THF have given manufacturers just what was needed to join PVC to PVC with a bond virtually as strong as the original materials. Result: new polyvinyl chloride products such as multi-purpose bags; a faster, easier way of joining plastic pipe and a stronger, better line of toys.

The unique solvent power and low boiling point of THF are opening doors to many other new and improved products. Fabric coatings, plastic sheet coatings, printing inks and lacquers are just a few. There will be many more.

If you think a powerful solvent for polyvinyl chlorides and other vinyl resins may help you improve your product or build a new one, we will be glad to send you more information about tetrahydrofuran. Just write: E. I. du Pont de Nemours & Co. (Inc.), Electrochemicals Dept., Wilmington 98, Delaware.



PHYSICAL PROPERTIES:

| | |
|----------------------------|-----------------------------------|
| Appearance | Colorless, mobile liquid |
| Odor | Ether-like |
| Molecular weight | 72.10 |
| Freezing point | -108.52°C. |
| Boiling range | 65-67°C. |
| Flash point | 6°F. |
| (Tag closed cup) | |
| Vapor pressure, mm Hg. at: | |
| 25°C. | 176 |
| 45°C. | 385 |
| 65°C. | 760 |
| Solubility | Miscible with water. |
| | Soluble in most organic solvents. |

Du Pont can assure you prompt delivery of tetrahydrofuran in tank car quantities.

Mail coupon for more information

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TETRAHYDROFURAN



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Poly-Eth News from the East



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New applications of Poly-Eth resins appear almost daily with new or improved fabricating techniques...An extruder in Virginia is extruding Poly-Eth 2005 into mirror-finished sheeting in gauges up to 1/8 inch...A Pennsylvania customer reports that because of the low shrinkage properties of

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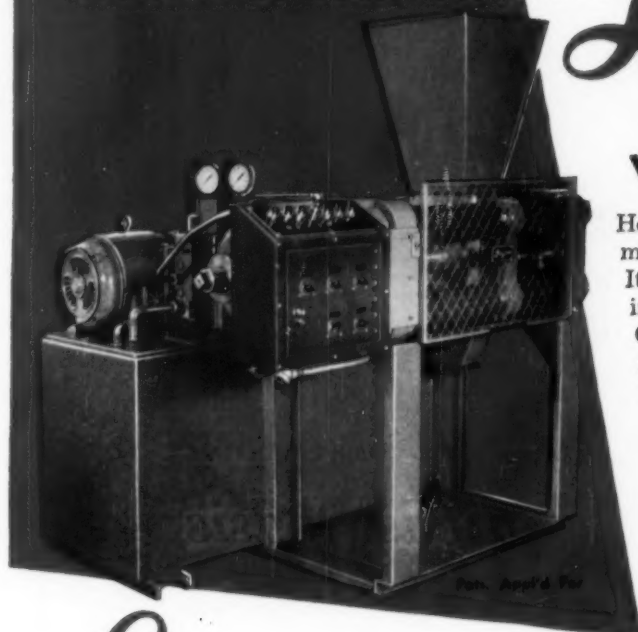
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Horizontal design permits gravity discharge, minimizing breakage and damage to preforms. It also makes possible automatic preforming of impact type materials rapidly and accurately. Operation is practically dust free. Rods and guides are fully enclosed. Ideal for automatic preforming of Melamine and Urea "Fines".

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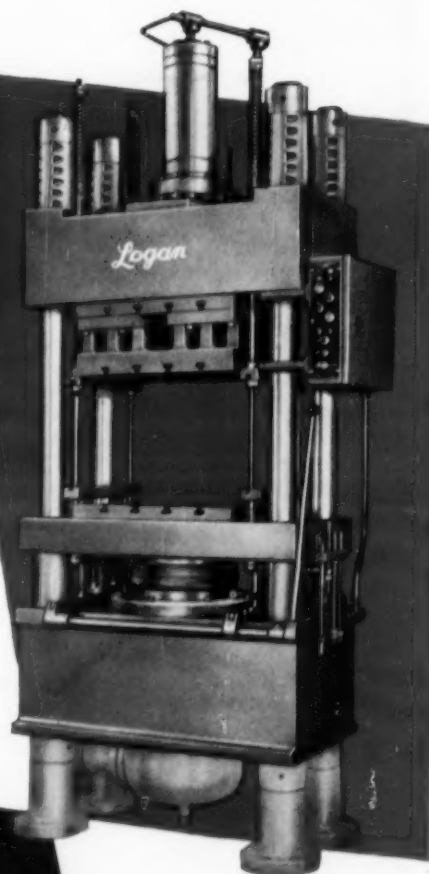
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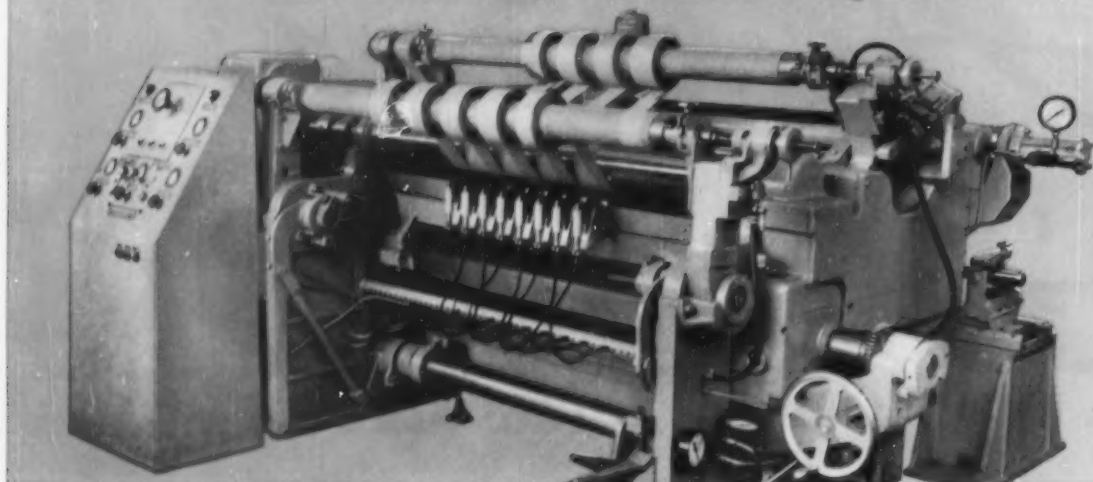
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extraordinary productive capacity and versatility for true economy plus top-quality slitting and winding

The following two features of the new 500 give you unmatched versatility:

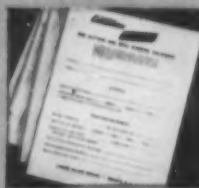
(1) FLEXIBILITY—quick changeover from one slitting method to another including score-cut, shear-cut, razor-cut, burst-cut, or SEALCUT® for fusing. **(2) REWIND QUALITY**—ultra-sensitive automatic rewind density control, to assure exactly the softness or hardness you need without stretching, snap-off or slack while running.

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Camachine 500 specifications include: trim widths up to 72"; finished rolls up to 20" dia.; speeds to 2000 fpm*. Write for Bulletin 1050.

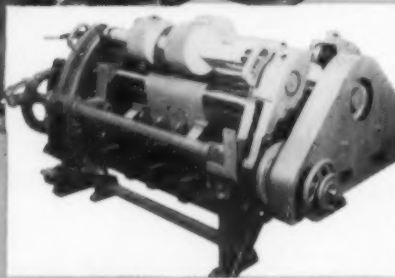
*Speed is dependent on machine width and character of products.

AA-307

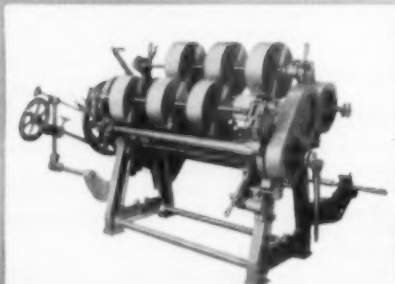


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"Dutch Boy" Plasticizers

| "Dutch Boy" Plasticizer | Low temp flex* Clash/Berg Deg Cent | % Volatility* 16 hrs, 195° F A/C-12 ml film | Vol Resistivity* at 25° C x 10 ¹² ohms/cm | Ref Index 25° C | Spec Gravity 20/20° C | Cost per lb | Suggested Uses |
|---------------------------------------|--|---|--|--------------------|--------------------------|----------------|---|
| Double Duty Primary Type | | | | | | | |
| <i>New</i> NL F-22 (semi-polymeric) | — 16.5 | 5 | | 1.480 | 0.977 | .36 | High quality extruded and calendered products |
| <i>New</i> NL F-32 (mixed adipate) | — 36 | 11 | | 1.449 | 0.919 | .425 | For low temp. flexibility and good volatility |
| <i>New</i> NL F-33 (modified adipate) | — 38 | 19 | | 1.447 | 0.920 | .415 | For excellent low temp. flexibility |
| NL F-41 (modified adipate ester) | — 36 | 13 | | 1.446 | 0.920 | .48 | High quality sheeting |
| General Purpose Economy Type | | | | | | | |
| NL A-54 (mixed alkyl phthalate) | — 3 | 15 | 80 | 1.482 | 0.976 | .295 | Wire insulation stocks |
| High Purity Standard Type | | | | | | | |
| NL A-10 (DBP) | | | | 1.490 | 1.046 | .30 | Lacquers |
| NL A-20 (DOP) | — 10 | 14 | 30 | 1.484 | 0.985 | .305 | General purpose |
| NL A-30 (DOP) | — 9 | 11 | 30 | 1.484 | 0.984 | .305 | General purpose |
| <i>New</i> NL A-40 (DOP) | — 6 | 3 | 50 | 1.482 | 0.965 | .305 | Plastisols and wire insulations |
| <i>New</i> NL A-50 (DOP) | — 7 | 7 | 35 | 1.484 | 0.975 | .305 | General purpose |
| NL C-20 (DOS) | — 36 | 7 | | 1.450 | 0.915 | .61 | General purpose with extremely high quality |

* Typical plastic mix. Details on request.



Take a *New* look at the latest developments in "Dutch Boy" Plasticizers

*See for yourself their outstanding
competitive advantages*

Look first at NL F-22, 32 and 33

New. Unique. NL F-22, 32 and 33 are "Dutch Boy" Double-Duty Plasticizers . . . a new type that gives you factory prebalanced low temperature flexibility and low volatility plus good stability and purity. See columns two and three, noting the high values of *both* properties. Note, too, that NL F-22 has outstanding low volatility.

A fourth "Dutch Boy" Double-Duty Plasticizer, NL F-41, is equally outstanding for low temperature flexibility.

Together, these four "F" Plasticizers make a valuable contribution to the materials available for producing vinyl film, sheeting and flooring compounds.

New look at NL A-40 and 50

These two new "Dutch Boy" standard Plasticizers reach a new high in commercial purity.

This new high in purity makes "Dutch Boy" NL A-40 particularly interesting to the insulated wire industry . . . makes "Dutch Boy" NL A-50 the logical ODP to replace DOP.

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If you would like full technical information on any of these plasticizers . . . or samples . . . write:



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Available about Oct. 1



Commercial

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SUPER-STRONG HEAVY DUTY RAYON

Fortisan-36 is a high-denier, heavy duty saponified acetate rayon—an even stronger version of famous Fortisan, designed primarily for industrial application.

Pilot plant quantities are now undergoing evaluation in mechanical rubber goods and other fields. Limited poundage is available for further experimentation.

Facilities for expanded production of Celanese Fortisan-36 are nearing completion. Commercial quantities, including 800 denier—800 filament and 1600 denier—1600 filament yarns will be available for delivery about October 1.

Extensive research and development work, both by Celanese and many large industrial users, has established Fortisan-36 as a singularly useful industrial yarn.

Fortisan-36's very high tensile strength, extremely high modulus and excellent dimensional stability

indicate that it will have an important place in the making of

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If you have a stake in any of these areas—or are concerned with any industrial application where high strength yarns are important—we'd like to work with you on the application of Fortisan-36 to your products.

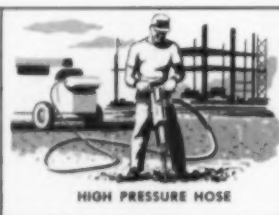
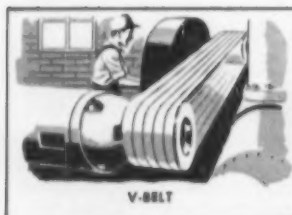
Our technical men have a wealth of data which may indicate some new approaches to your problems.

For further information, write Celanese, Industrial Sales Department, Textile Division, Charlotte, North Carolina.

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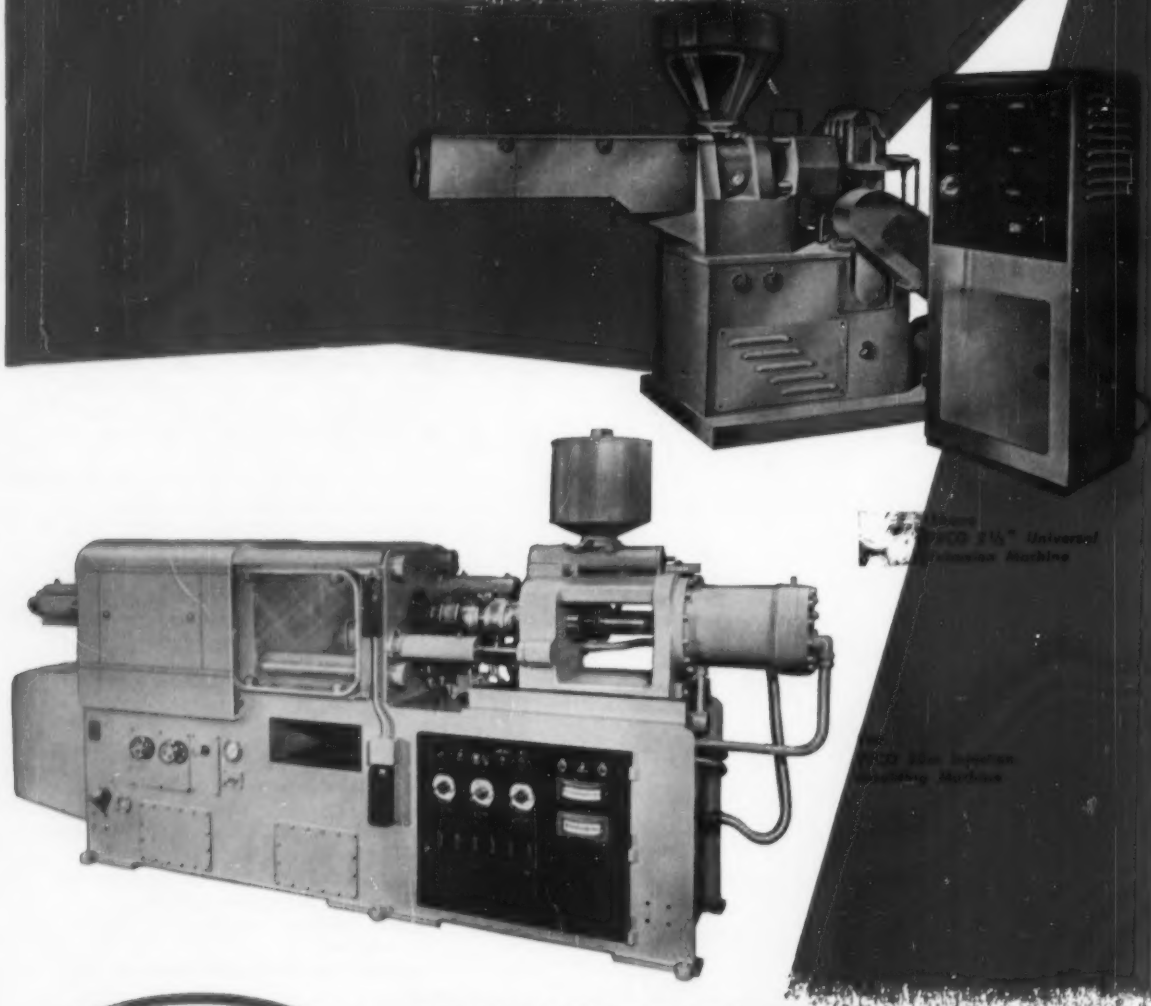
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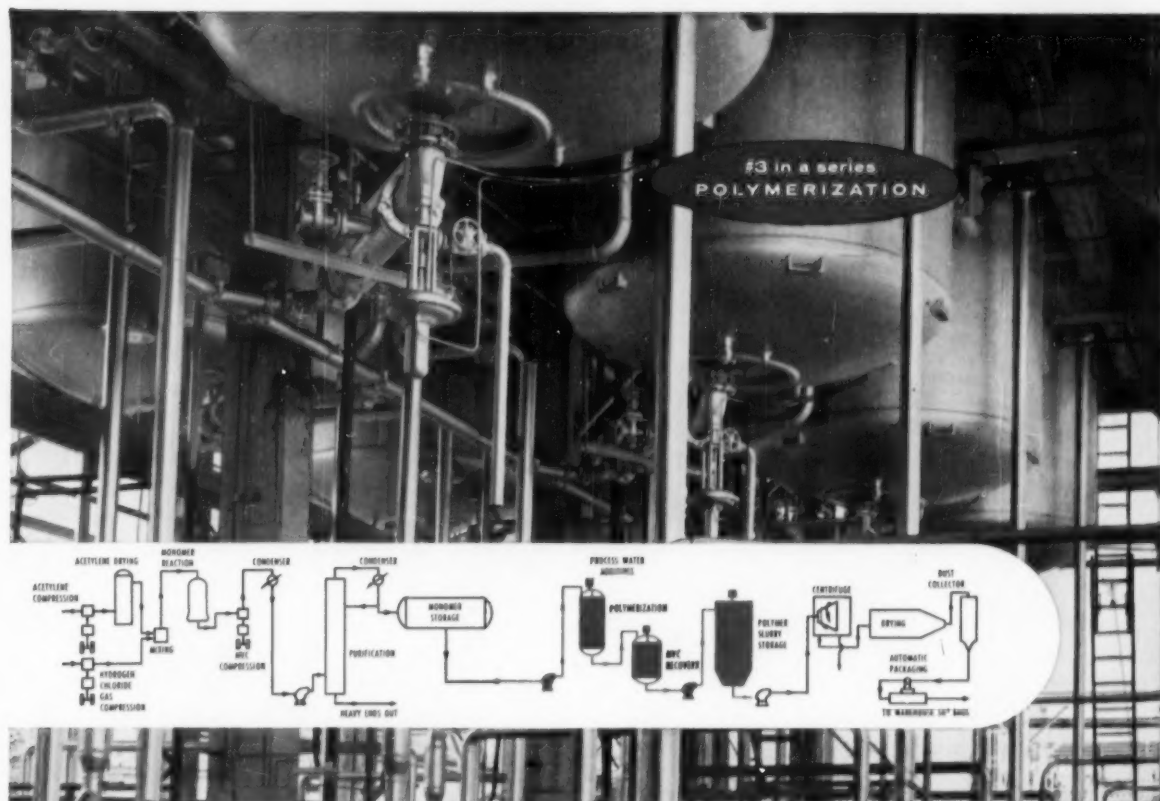
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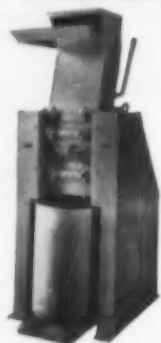
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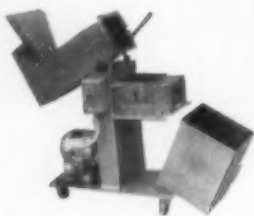
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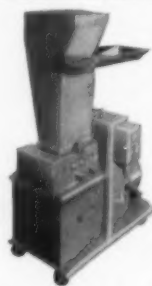
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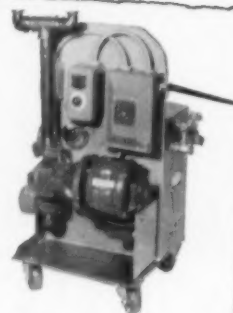
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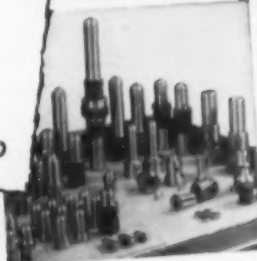


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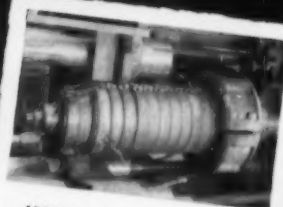
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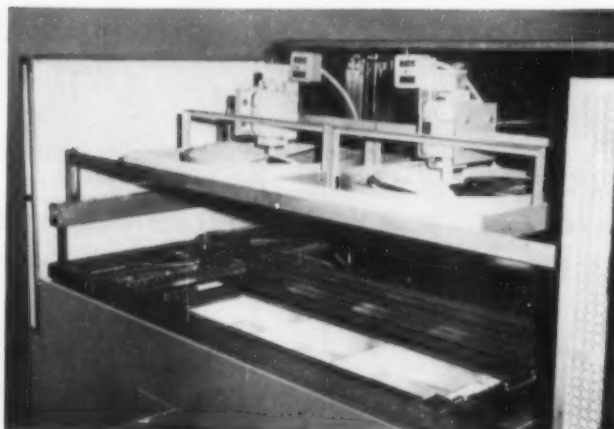
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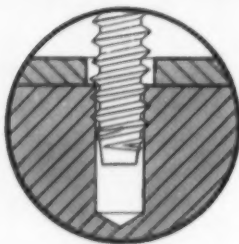
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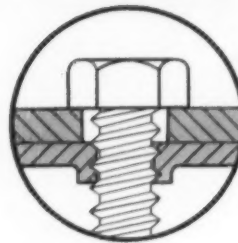
Start Right



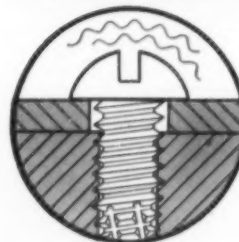
Drive Right



Seat Right



Stay Tight



Millions in savings made with P-K Screws since they were originated by Parker-Kalon have proved the Self-tapping Screw *method* reduces assembly costs.

But it takes more than the right method to make sure planned savings pay off. It takes P-K quality standards to guard against defective screws that cause assembly trouble, costly damage to parts, and hidden weakness that shows up in customer complaints.

Only Parker-Kalon can offer P-K quality, the indispensable extra, along with the proved advantages of Self-tapping Screws.

Plan your assemblies for lowest cost . . . a P-K Assembly Engineer will help you. Then make sure *planned savings keep on paying off* . . . when you purchase, order "P-K". Parker-Kalon Division, General American Transportation Corporation, 200 Varick Street, New York 14.

PARKER-KALON®

The First **SELF-TAPPING SCREWS**

originated by P-K . . . and *first* today . . .
the leading choice for fastening economy



Remember

P-K means

OK



Another
PLASTICS PROCESSOR
Standardizes ON

NRM *Thermoplastic* **EXTRUDERS**

"At Plaskolite, we know how to appreciate the fast output of accurate, high-quality extrusions and low operating cost of our NRM Extruders," stated Mr. Norris H. Olson of Plaskolite, Inc., Columbus, Ohio. "Our products clicked in the market right off the bat when we started in business five years ago. But profits really began to climb when we added NRM Extruders to our production equipment. Buying NRM's was one of the best decisions we ever made, and in the future, we will continue to buy NRM's."

It pleases us at NRM to know our Extruders contribute so substantially to the success of plastics producers. Plaskolite, for instance, has outgrown its first plant in barely five years. From its new and much larger plant, this company fur-

nishes NRM-produced extrusions for many accounts among prominent manufacturers of signs, appliances and lighting fixtures . . . with capacity left over for profit-making extras like plastic sheet, LIFETIME Plastic Flyswatters and Plastic Drinking Straws.

Plaskolite's experience with NRM Extruders is the typical experience of NRM users the world over. A few of the advanced design features which make NRM the most profitable Extruder to operate are 20:1 L_e/D ratio cylinders, quick-opening die gates, balanced heat control and rugged, corrosion-resistant construction. Get full information on these and many other NRM advantages, if you're planning to purchase plastic extruders and equipment. **WRITE TODAY.** . . there's no obligation.

Z40B

NATIONAL RUBBER MACHINERY COMPANY

General Offices and Engineering Laboratories:

47 West Exchange St., Akron 8, Ohio

EASTERN PLANT: 384 Getty Ave., Clifton, N. J.

SOUTH: The Robertson Company, Rutland Building, Decatur, Ga.

WEST: S. M. Kipp, Box 441, Pasadena 18, Cal.

EXPORT: Omni Products Corporation, 460 Fourth Ave., New York, N. Y.

NRM

*Creative
Engineering*

Marvibond

New vinyl-to-metal gives metal the corrosion

Naugatuck's new and exclusive laminating process bonds Marvinol® vinyl sheeting to practically any kind of sheet metal—permanently! It gives metals all the famed corrosion and chemical resistance of vinyl plastic, one of the most inert of all known materials!

New Marvibond laminates end rusting—resist acids, alkalies, salt water, alcohol, household chemicals, corrosive industrial liquids and atmospheres . . .

• **give far greater corrosion and abrasion resistance than galvanized steel**—much superior to varnish, phenolic, or alkyd finishes!

• **withstand weather and humidity indefinitely!**

• **remain dimensionally stable up to 250°F!**

• **take more than 40 lbs. per inch in lap-off tests!**

• **will not chip, crack, craze, or flake off!**

• **will not support combustion!**

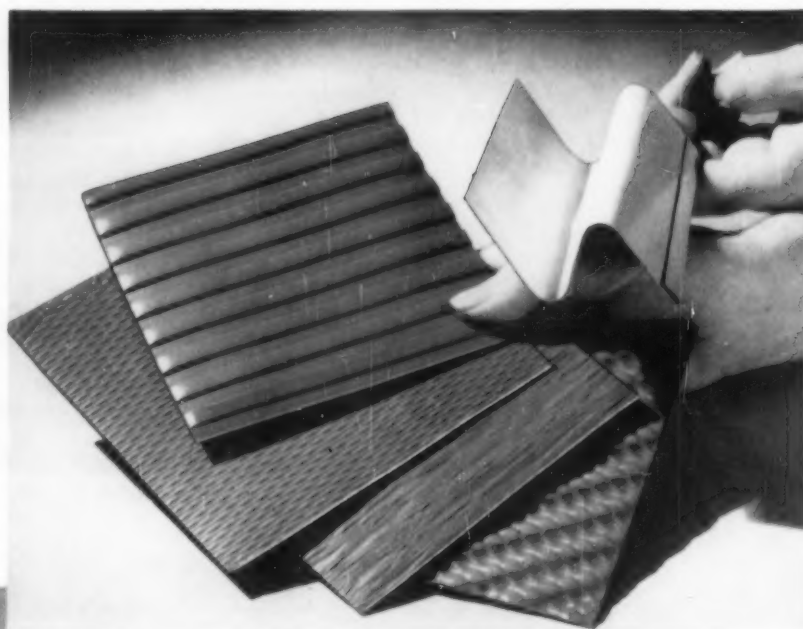
• **can be deep drawn, sheared, crimped, bent, embossed, drilled,**

and punched—with standard tools—without damage to coating or bond!

• **and cost less than stainless steel!**

Since Marvibond involves lamination rather than spraying, it gives all the excellent chemical, abrasion, and heat resistance of a polyvinyl chloride—protection not obtainable with a solution grade vinyl. *And it gives this superior protection at less cost.*

Illustrated are just a few of the many forms and products into which Marvibond has been fashioned—suggesting the tremendous scope of product possibilities this new process opens up.



laminating process resistance of vinyl plastic!

Why not **Marvibond** for...



shower stalls?



small toys, carts, and
accessories?



decorative panels and
office partitions?



furnishings for home,
office, or hospital?

Why not these and hundreds more . . . chemical ducts and processing equipment . . . machine housings . . . containers of all sorts . . . electrical switch boxes and plates . . . metal tiles . . . table tops . . . air washing systems . . . countless products of practi-

cally every description.

Why not *your* product? If it's made of sheet metal (or could be), Marvibond offers both beauty and protection unexcelled. Better write to the address below for more details and sample test data.



Naugatuck Chemical

Division of United States Rubber Company
Naugatuck, Connecticut



BRANCHES: Akron • Boston • Gastonia, N. C. • Chicago • Los Angeles • Memphis • New York • Philadelphia • IN CANADA: Naugatuck Chemicals, Elmira, Ontario
Rubber Chemicals • Synthetic Rubber • Plastics • Agricultural Chemicals • Reclaimed Rubber • Latexes • Cable Address: Rubexport, N. Y.

NEW R/M ASBESTOS FELT FOR EXTREME HEAT CONDITIONS AND FLAME RESISTANCE



R/M No. 9526 Pyrotex® Felt is a completely inorganic felt designed for use in reinforced laminates—and is suggested for such end applications as rocket and guided missile control surfaces, fuel containers, combustion and exhaust chambers. It is 100% long, staple, non-ferrous asbestos fiber and has exceptional multi-directional developed properties:

| | |
|-----------------------|-------------------------|
| tensile strength | 50-55,000 psi |
| flexural strength | 60-65,000 psi |
| compressive strength | 30-35,000 psi |
| modulus of elasticity | 4-5x10 ⁶ psi |
| developed properties | relatively isotropic |



Write on your company letterhead for a free copy of a brochure containing technical and design data on R/M's unique line of Pyrotex Felts, Novabestos® Papers, and Asbestos Cloths.



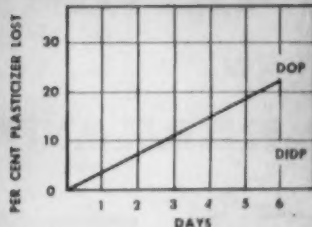
RAYBESTOS-MANHATTAN, INC. ASBESTOS TEXTILE DIVISION, Manheim, Pa.

FACTORIES: Manheim, Pa. • Bridgeport, Conn. • No. Charleston, S.C. • Passaic, N.J. • Neenah, Wis. • Crawfordsville, Ind. • Peterborough, Ont., Canada

RAYBESTOS-MANHATTAN, INC., Asbestos Textiles • Packings • Brake Linings • Brake Blocks • Clutch Facings • Fan Belts • Radiator Hose • Rubber Covered Equipment • Industrial Rubber, Engineered Plastic, and Sintered Metal Products • Abrasive and Diamond Wheels • Bowling Balls



SUPERIOR VISCOSITY STABILITY OF DIDP (right) vs. DOP after one-week storage at 50° C. DIDA and DIDP also give plastisols low initial viscosity. All decyl plasticizers are superior to comparable octyl esters in this characteristic.



40 MIL SHEETING
CONTAINING 40% PLASTICIZER



LOW SOAPY-WATER EXTRACTION. DIDP keeps products soft, manageable, after many washings. After 24 hours at 50° C. in a 1% soap solution, 2.0% DOP is extracted, only 0.5% DIDP. All decyl plasticizers are superior to comparable octyl esters in this characteristic.

Boost profits...broaden your line with Monsanto's five decyl plasticizers



S-606

(mixed phthalate)

Santicizer 606 offers optimum processing characteristics, alkali and grease resistance and flexibility at the lowest pound-volume cost. Specially suited for vinyl floor tile.



S-603

(butyl decyl phthalate)

Santicizer 603, a low pound-volume cost plasticizer. Offers good flexibility, good color, low specific gravity, fusion characteristics similar to DOP. Used in film, sheeting, extrusions and plastisols.



DIDA

Offers excellent low-temperature flex and lower volatility than DOA or DOP. High tensile strength, good heat and light stability, excellent moisture resistance. Used in garden hose, free film and sheeting, coated fabrics.



DIDP

Low volatility, excellent retention of properties after severe heat aging, good electrical properties, superior plastisol viscosity stability. Excellent resistance to extraction by soapy water. Used for thin films, upholstery materials, wire compounds, plastisols, floor tile.



S-602

(iso octyl iso decyl phthalate)

Santicizer 602 offers good softening efficiency and resistance to soapy-water extraction, high alkali resistance, lower volatility than DOP or DIOP (other properties comparable). Used for floor tile, plastisols, film, sheeting, coated fabrics.

FOR TECHNICAL BULLETINS AND DATA SHEETS on DIDA, DIDP, S-602, S-603, S-606, write: Organic Chemicals Division, Monsanto Chemical Company, Box 478-M-4, St. Louis, Missouri.



SERVING INDUSTRY
WHICH SERVES MANKIND

Santicizer Reg. U. S. Pat. Off.

HOW PIASECKI HELICOPTER FORMS HOLLOW

PLASTIC AND NEOPRENE PARTS

WITH NEW

Certain-teed® BREAKAWAY PLASTER



Here Certain-teed Breakaway Plaster is being poured into a plaster mold at the Piasecki Helicopter Corp. plant outside Philadelphia. This is the first step in making an expendable Breakaway mandrel on which a polyester laminate compass support will be formed.



Another use for Breakaway Plaster at Piasecki. A Breakaway mandrel used to make a Neoprene power plant control boot in a Piasecki H-21C helicopter is removed from a rubber forming mold. Molds for casting mandrels of Certain-teed Breakaway Plaster may be of metal, wood, rubber or plaster.



Workman applies parting agent to Breakaway Plaster mandrel to prevent adhesion of the plaster to the Neoprene part. Lighter pieces in background are the plastic laminates applied over the mandrels. Darker pieces at the right have been coated with Neoprene and are ready for curing.



Here the Certain-teed Breakaway Plaster is being washed out of the molded power plant control boot after the curing operation. Water at 170° F. quickly flushes the expendable Breakaway mandrel from the most intricate shapes without malforming or breaking the part.

Certain-teed's new, improved Breakaway Plaster is a gypsum base composition specially formulated for the production of hollow shapes formed of glass fiber mats reinforced with resins. With this new formula, excellent results can be obtained more quickly and easily, and at less cost than ever before.

Before switching to Certain-teed

Breakaway Plaster, Piasecki Helicopter Corp. used a material which had to be manually broken out. This sometimes caused a breaking or malforming of the part and resulted in waste and higher manufacturing costs.

Breakaway Plaster can be quickly and easily washed out of the most intricate shapes with hot water or steam. It is readily adaptable to any contour.

Whatever your requirements, Certain-teed and its distributors are ready to work closely with you, and to recommend the specific industrial plaster that will improve your product or raise your plant efficiency.

Write or call the nearest Certain-teed Sales Office now for the name of your Certain-teed Distributor. See the list of offices below.



Certain-teed

REG. U.S. PAT. OFF.

Quality made Certain...Satisfaction Guaranteed

District Sales Offices in—ATLANTA, GA. • CHICAGO, ILL. • CLEVELAND, OHIO • DALLAS, TEXAS • DES MOINES, IOWA • DETROIT, MICH. • EAST ST. LOUIS, ILL. • JACKSON, MISS. • KANSAS CITY, MO. • MINNEAPOLIS, MINN. • NIAGARA FALLS, N. Y. • PHILADELPHIA, PA. • RICHMOND, CALIF. • SALT LAKE CITY, UTAH • TACOMA, WASH.

• **CERTAIN-TEED PRODUCTS CORPORATION**
• INDUSTRIAL DIVISION • ARDMORE, PENNSYLVANIA
• EXPORT DEPARTMENT, 100 East 42nd Street, New York 17, N. Y.

• A Complete Line of Gypsum Plasters for Industry
• Certain-teed is the sole manufacturer of the widely accepted line of Densite® industrial gypsum plasters. Sales Engineers are available through your nearest District Sales Office.



Giant molding presses produce large size parts for many diversified applications.

Modern vacuum plating equipment is used for applying decorative metallic finishes on top- or under-surface of molded parts.



The Facilities and the Know How

Erie Plastics, a division of Erie Resistor Corporation, is one of the largest producers of custom injection molded plastics. All operations, from die design to final finishing, are conducted in a single, completely integrated plant.

Three factors are responsible for the reputation ERIE has gained for superior quality and production efficiency — highly skilled craftsmen, with the

know-how that comes from years of practical experience . . . the most complete and modern production equipment . . . quality control at every phase, from raw material to final inspection. Leading manufacturers in many industries rely on ERIE . . . the pioneer in custom molded plastics . . . for the execution of their ideas, or for help in formulating them.

A total of 25 injection molding presses range in size from 8 oz. to 120 oz. rated capacity.

TRADE **ERIE** MARK
CUSTOM MOLDED
plastics



Plating is done with the most up-to-date equipment, some of which is shown in this photograph.

Hot stamping, foiling, and silk screening are essential finishing operations in producing eye-catching designs.



Dies are laid out and designed by ERIE engineers and are serviced and often produced in our modern die shop.



Molded plastic parts are decorated with special lacquers and paints in these spray-paint booths.



ERIE
plastics

ERIE PLASTICS DIVISION

ERIE RESISTOR CORPORATION

Main Offices and Factories: **ERIE, PA.**

Manufacturing Subsidiaries

HOLLY SPRINGS, MISSISSIPPI • LONDON, ENGLAND • TRENTON, ONTARIO

Fabric helps Anaconda



Giant fans expel 300,000 cu. ft. of air per minute from working areas through nylon fabric tubes.

clear the air — one mile down!

In Anaconda's Butte mine workings—a mile below the earth's surface—temperatures sometimes rise above 100° F. Humidity may be 98%. Dust thickens and clings.

Coated fabric tubes are Anaconda's answer to the ventilation problem, resulting in greater mine safety, more comfortable working conditions. Made of Wellington Sears filament nylon fabric coated with neoprene, these tubes carry dust-laden air to proper exhaust exits.

Their fabric must be flexible—it twists through corridors. It must be strong to withstand abrasion. It must be light (14 oz. a sq. yd.) for easy movement. It must resist the disintegrating forces of heat, humidity, dust, mildew and acids. Wellington Sears is proud that its DuPont nylon fabrics will be installed in all Butte mine workings.

This fabric is only one of many types and constructions offered by Wellington Sears for coating and impregnation. Whether your need is the right fabric for neoprene, vinyl or rubber coating—you'll find your answer at Wellington Sears.

Wellington Sears

A Subsidiary of West Point Manufacturing Company

FIRST In Fabrics For Industry

For Coated Materials, High and Low Pressure Laminates
And Other Reinforced Plastic Products

Wellington Sears Co., 65 Worth St., New York 13, N. Y. • Atlanta • Boston • Chicago • Dallas • Detroit • Los Angeles • Philadelphia • San Francisco • St. Louis

CYCOLAC[®]

THE *New* HIGH-IMPACT THERMOPLASTIC RESIN



Gives your products
a **NEW DIMENSION**
for selling!

... and that goes for their manufacture, too ... whether you are in the business of manufacturing post-formed business-machine housings, typewriter cases, containers, signs, instrument cases, luggage, vacuum cleaner housings, or what have you. CYCOLAC sheet can be produced by extrusion, calendaring or press-polishing. CYCOLAC sheet is tough yet lightweight; it has low shrinkage and can be embossed or grained, solvent-welded, sawed, drilled, buffed, painted, etc., ... and it's so colorful, too!

GET THE FACTS: Write for Technical Literature **TODAY!**

CYCOLAC — the one uniform resin that makes good products **BETTER**

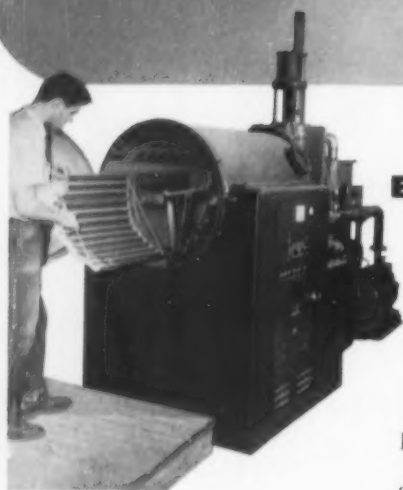
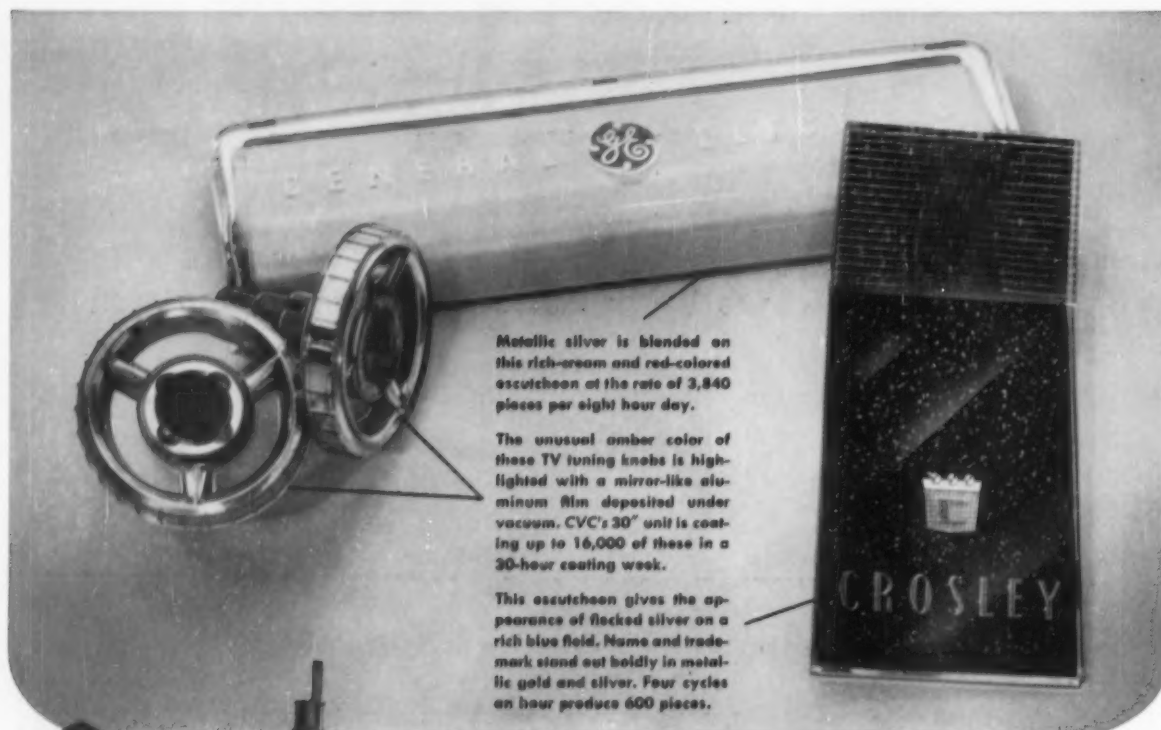


MARBON CHEMICAL

Division of BORG-WARNER

GARY, INDIANA

MARBON . . . Precision Resins for Precision Made Products



This CVC type LCI-30 high-vacuum coater is metallizing escutcheons and other parts at Buffalo Molded Plastics Inc. Photo shows operator inserting loaded racks into the coater. Like all CVC coaters, this unit was delivered with all necessary equipment ready for immediate installation.

Brilliant Escutcheons by the thousand

CVC vacuum metallizing fills heavy production quotas fast

"WE are already operating at four cycles an hour with our new CVC coater," writes Charles E. Catalde, President, Buffalo Molded Plastics Inc.

"This is more than adequate for our present production quotas. However, when we're ready for increased production, I'm sure we can add another complete cycle without any trouble."

The CVC vacuum coater Mr. Catalde speaks of gives a chamberful of parts a brilliant metallic luster in a matter of minutes.

And it doesn't require a skilled operator—a few hours experience in the use of the machine trains any of your help to turn out flawless pieces in large quantities.

The operator simply inserts racks

of lacquered parts into the vacuum chamber, valves in the roughing pump for initial evacuation, and then opens the high-vacuum valve to the diffusion pump. In a matter of seven or eight minutes the chamber pressure reaches the desired level and the operator flashes the filament which evaporates the aluminum. Immediately the aluminum begins to condense on the parts. It's easy. It's inexpensive.

We'll be glad to share our experience in vacuum metallizing and associated lacquer operations to help you set up your own system.

For further information, write to **Consolidated Vacuum Corporation, Rochester 3, N. Y.** (a subsidiary of Consolidated Engineering Corporation, Pasadena, California).



Headquarters
for High Vacuum

Consolidated Vacuum Corporation Rochester 3, N. Y.

a subsidiary of CONSOLIDATED ENGINEERING CORPORATION, Pasadena, California

CVC sales now handled through Consolidated Engineering Corporation with offices located in: Albuquerque • Atlanta
Boston • Buffalo • Chicago • Dallas • Detroit • New York • Palo Alto • Pasadena • Philadelphia • Seattle • Washington, D. C.

Modern Plastics

colors for the plastics industry...

*as uniform as
two peas in a pod*



CLAREMONT'S CALIBRATED COLORS

D SERIES — color pastes for vinyl banbury compounding

K SERIES — color pastes for plastisol compounding

V C — vinyl rotogravure inks for sheeting and film

V C — valley vinyl printing inks

D R SERIES — vinylized colors for extrusion

4000 SERIES — lightfast colors for polyester molding

All CLAREMONT PIGMENT CORP. products are guaranteed. You select your color just ONCE... it will never vary because of CLAREMONT'S calibration procedure.

Write today to find out how these new products can mean color uniformity from run to run for you.

SPECIAL OF THE MONTH

New high luster non tarnishing golds for application to vinyls by gravure printing, valley printing, silk screening or spraying.

Claremont

PIGMENT DISPERSION CORP.

413 Flushing Avenue, Brooklyn 11, N. Y.



little things count...
**in making
vinyl upholstery, too!**

Small amounts of the *right* stabilizers, carefully calculated to fit your production, can greatly improve the service life of vinyl upholstery materials . . . assuring customer satisfaction. May we help you?

Ferro Vinyl Stabilizers

FERRO CHEMICAL CORPORATION • BEDFORD, OHIO

A Subsidiary of Ferro Corporation



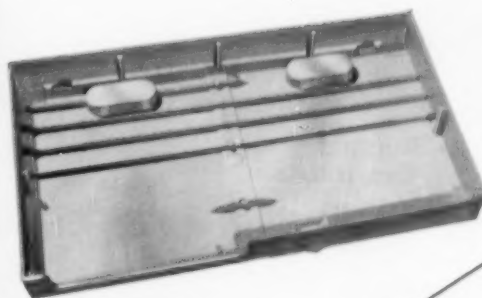
YARDLEY *for quality*

EXTRUSION . . . INJECTION . . .

VACUUM FORMING



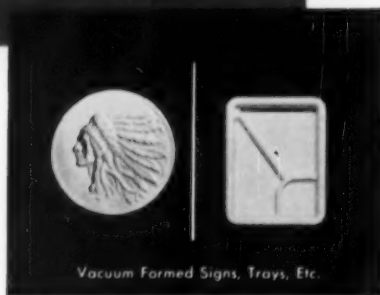
Extruded Plastic
Pipe and Tubes
Rough to 1/8 inch



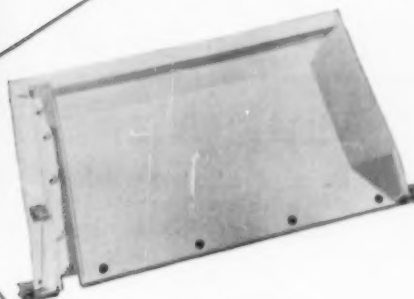
Refrigeration Baffles, Radio
Cabinets, Air Conditioner
Cases; to 60 oz.



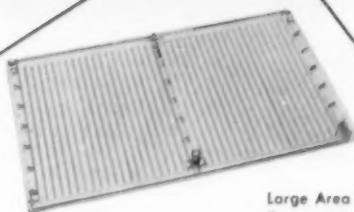
Vacuum Forming,
Displays,
Large Areas



Vacuum Formed Signs, Trays, Etc.



Refrigeration Pans,
Drawer Fronts,
Frames, etc.



Large Area
Transparent Moldings

TUBING for
Sight Gauges
Irrigation
Toys
Musical Instruments
Packaging
Radio Parts
Conveyors
Water Pipe
Oil and Gas Lines
Garden Hose

GASKETS for
Metal Buildings
Refrigerators
Appliances
Storm Windows
Dry Glazing
EDGING for
Linoleum
Glass
Tables
Decorative Use

**EXTRUDED and
MOLDED PARTS for**
Vacuum Cleaners
Fluorescent Lights
Breaker Strips
Belts
Sheet
MOLDERS of
Wall Tile
Housings
Premiums
Refrigerator Parts

*There is an experienced
Yardley representative near you.*

Send us your problem.



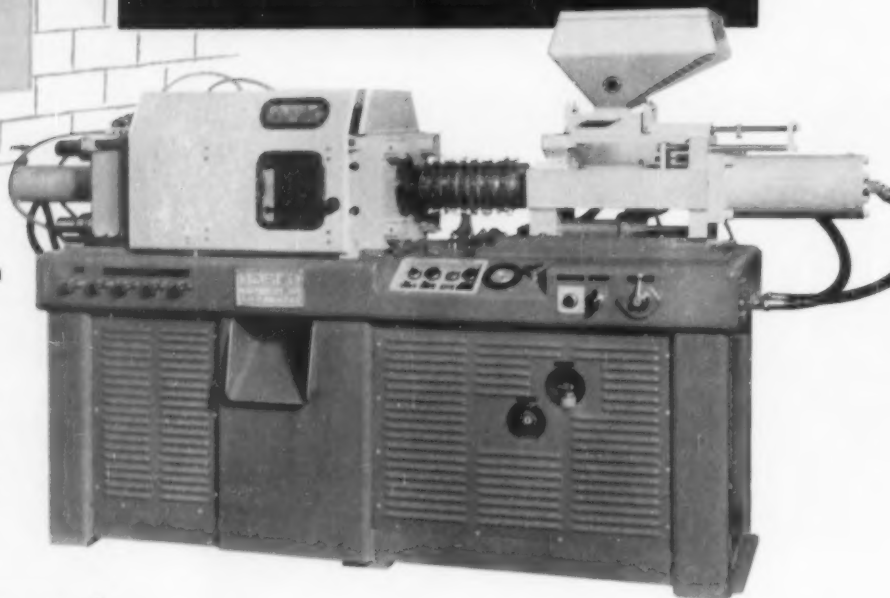
YARDLEY PLASTICS CO.

142 PARSONS AVE., COLUMBUS 15, OHIO

In Canada: DAYMOND CO., LTD., Chatham, Ont.

Increase Production and Reduce Costs

- Rugged Construction
- High Speed Operation
- Completely Automatic
- Unexcelled Plasticizing



with the improved

Moslo Model 75 Plastic Molding Machine

Here's the last word in injection plastic molding machines. The molding machines of tomorrow—here today.

The Moslo Model 75 is a high-speed, 3 ounce unit that plasticizes material at the rate of 70 lbs. per hour and is capable of 750 cycles per hour—(dry run). Its amazing performance will out-produce machines of 2 to 4 times its capacity.

With this high production rate, plus a modest initial investment and low mold costs, the Model 75 is a real profit builder that has no equal.

In addition, the 75 is a terrific machine in every other way. Built like the "Rock of Gibraltar", it will stand the gaff of continuous operation. The most modern safety devices and automatic controls assure you of de-

pendable service and maximum protection to the operator, material and machine.

Actually words and pictures hardly tell the story. The best way to convince yourself of the merits of the Moslo Model 75 is to see it perform. We invite you to visit our plant and we will gladly make a demonstration using your molds. Should you want additional printed information, we will send it immediately.

Look at these features

| | |
|------------------------------|---------------------------|
| • Plasticizing capacity | 70 lbs. per hour |
| • Cycles per hour—dry run | 750 |
| • Maximum injection pressure | 20,000 p.s.i. |
| • Mo'd opening | 8 inches |
| • Mold size | 11 7/8 inches x 15 inches |
| • Mold thickness—minimum | 8 inches |
| • Mo'd thickness—maximum | 13 inches |
| • Mold locking force | 145 tons |

MOSLO MACHINERY COMPANY

2437 PROSPECT AVENUE • CLEVELAND 15, OHIO

only **ONE** plant

offers you **ALL** these

SPECIAL PLASTICS SERVICES

to help you **REDUCE COSTS, SAVE LABOR**
SHORTEN PRODUCTION TIME, USE LESS MATERIALS

- POLYETHYLENE
- CELLULOSE ACETATE
- ETHYL CELLULOSE
- POLYSTYRENE
- BUTYRATE
- VINYL
- ACRYLIC
- NYLONS

SERVICE
QUALITY
DEPENDABILITY

GER-PAK: Polyethylene Film, Tubing, Sheetting from .0005 to .100; also superior quality TS treated non-rub-off Printable Surface for display packaging.

GER-FLEX: Vinyl

GER-YUBE: Polyethylene Tubing from .060 to 4" I.D. Also special shapes, cross-sections, profiles, etc. Rigid and flexible formulations.

EXTRUDED ACRYLIC and HI-IMPACT SHEETS: Gauges .060 to .125; widths 54"; lengths 76"; continuous rolls. Clear and colors.

DRYCOL: Perfected in-plant on-the-spot colorant for all thermoplastics.

S-T-R-E-T-C-H: Polyethylene master-batch color concentrate.

STYROMIX: Clear polystyrene dry blended with color and lubricants, ready to mold.

PURGING COMPOUND: Eliminates need for disassembling injection molding cylinders. Cleans quickly thoroughly.

CUSTOM COMPOUNDING: Complete processing and laboratory facilities for long or short runs; special and standard formulations of all thermoplastics from virgin resins for injection and extrusion molding.

SCRAP-WASTE-REJECTS: Our experts will reprocess and rejuvenate, or we will purchase your accumulations.

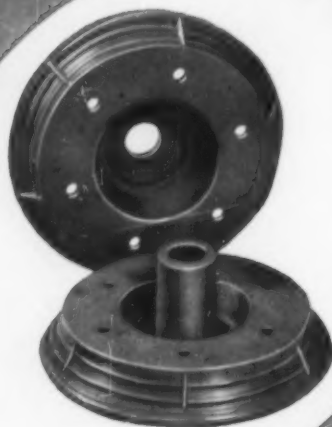
GERING

Who else but "Pioneers in Conversion of Thermoplastics for over 30 Years"

GERING PRODUCTS, INC. Kenilworth, N. J.

BRANCH Offices: Chicago, Ill.; Mansfield, Ohio; Cleveland, Ohio; Detroit, Mich.

for **TOUGH** molding jobs...



METASAP® STEARATES

deliver easier mold release

HAVE you tried Metasap Zinc or Calcium Stearates for easy ejection from the mold of intricate shapes, for deep drawing, or for larger-than-average pieces? You'll find they give just the results you want.

Blend these fine stearates into the molding compound—or sprinkle them on the molding surface. Either way, you'll find you need lower ejection pressures, get higher output, fewer rejects, better finished products. Molds last longer too.

So specify compounds containing Metasap Stearates or incorporate them into your own molding compound. Metasap Technical Service will gladly help you find the materials and mixing procedures best fitted to your production methods.

And to produce economical plastigels . . . Metasap offers a complete line of quality stearates, effective as thickening agents. Free testing samples of Magnesium, Barium, Calcium, or Aluminum Stearates are yours on request.

Reg. U. S. Pat. Off.



METASAP CHEMICAL COMPANY, Harrison, N. J.

Chicago • Boston • Cedartown, Ga. • Richmond, Calif.

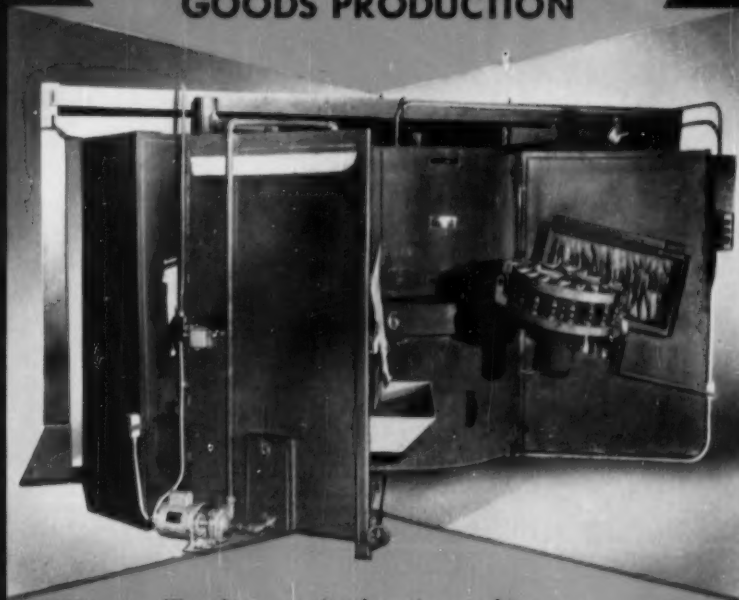
Stearates

of Calcium • Aluminum • Lead • Magnesium • Zinc

MOLD MORE PROFITS AUTOMATICALLY! ROTATIONAL PLASTISOL CASTING

Profits go up when you install our fully automatic rotational casting machine for making hollow plastisol articles. It is a high speed production unit, operated by one person who handles only the raw material and the finished product.

HERE IS THE MACHINE WHICH IS REVOLUTIONIZING HOLLOW GOODS PRODUCTION



The above rotational casting machine consists of a turret base on which are assembled six radial arms, each carrying multiple cavity molds equivalent to a 25 inch diameter molding area. The machine is adjustable from a cycle of 3 to 5 revolutions per hour and the individual spindles rotate at separately controlled speeds. The cycle of production carries the multiple cavity molds through the electric oven for progressive gelling, thermosetting and through cooling chamber, emerging with finished, resilient products. The machine is very compact and can produce as many as 1620 articles per hour. Tell us what you wish to manufacture and we will tell you how to make it faster, with more profit.

NEW PRODUCTS?

New products keep life flowing in any business and our rotational plastisol casting machine offers new opportunities. If you have a new product idea, call on our development department for assistance.

THE AKRON PRESFORM MOLD CO.

Phone: WALbridge 8-2015
CUYAHOGA FALLS, OHIO

FORMS
LATEX DIPPING

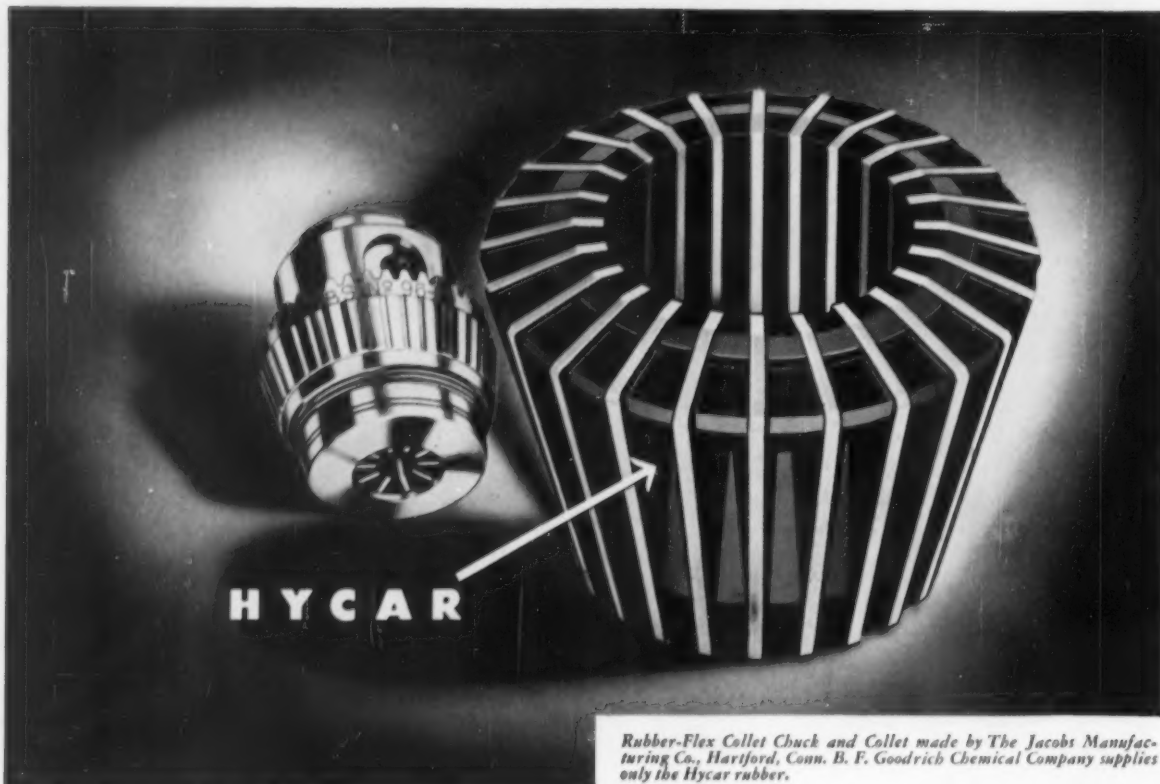
MOLDS
STEEL AND ALUMINUM

DIES
PLASTIC-INJECTION

MACHINERY
SPECIAL-AUTOMATIC

Another new development using

B. F. Goodrich Chemical raw materials



Left: Jacobs Model 85-05 Rubber-Flex Collet Chuck
Right: Jacobs Rubber-Flex Collet

Rubber-Flex Collet Chuck and Collet made by The Jacobs Manufacturing Co., Hartford, Conn. B. F. Goodrich Chemical Company supplies only the Hycar rubber.

Rubber-Flex Collet grips steel or glass

11 COLLETS GIVE 88 DIFFERENT SIZE GRIPS

WHEN the Jacobs people, who know their chucks, got together with the Hycar people, who know their rubber, they came up with the new Rubber-Flex collet chuck and the tightest, most accurate grip ever devised.

The chuck's Rubber-Flex collets, made with Hycar American rubber, have a capacity range eight times that of ordinary split steel collets. They come to grips equally well with either tools or work, solid stock or thin-wall tubing, compressible or brittle materials... even glass and ceramics.

Hycar rubber is a basic factor in the success of the collet chuck on a

whole new range of applications... on grinders, jig borers, reamers, and other high precision machines. The Hycar locks the collet's steel jaws mechanically together, insuring an absolutely parallel grip over the entire bearing surface, and actually *tightening* the grip when torque is applied. And vitally important, Hycar effectively resists the deteriorating action of lubes and coolants, withstands shocks and flexing.

Versatile Hycar is used in many industries. It has exceptional resistance to abrasion, oil, gas, heat, cold and many chemicals. Any one or combination of Hycar's qualities may be just what you need to improve a

product part or solve a tough product problem. For complete technical service and information on uses for Hycar, please write Dept. CF-5, B. F. Goodrich Chemical Company, Rose Building, Cleveland 15, Ohio. Cable address: Goodchemco. In Canada: Kitchener, Ontario.

B. F. Goodrich Chemical Company
A Division of The B. F. Goodrich Company

Hycar
Reg. U.S. Pat. Off.
American Rubber

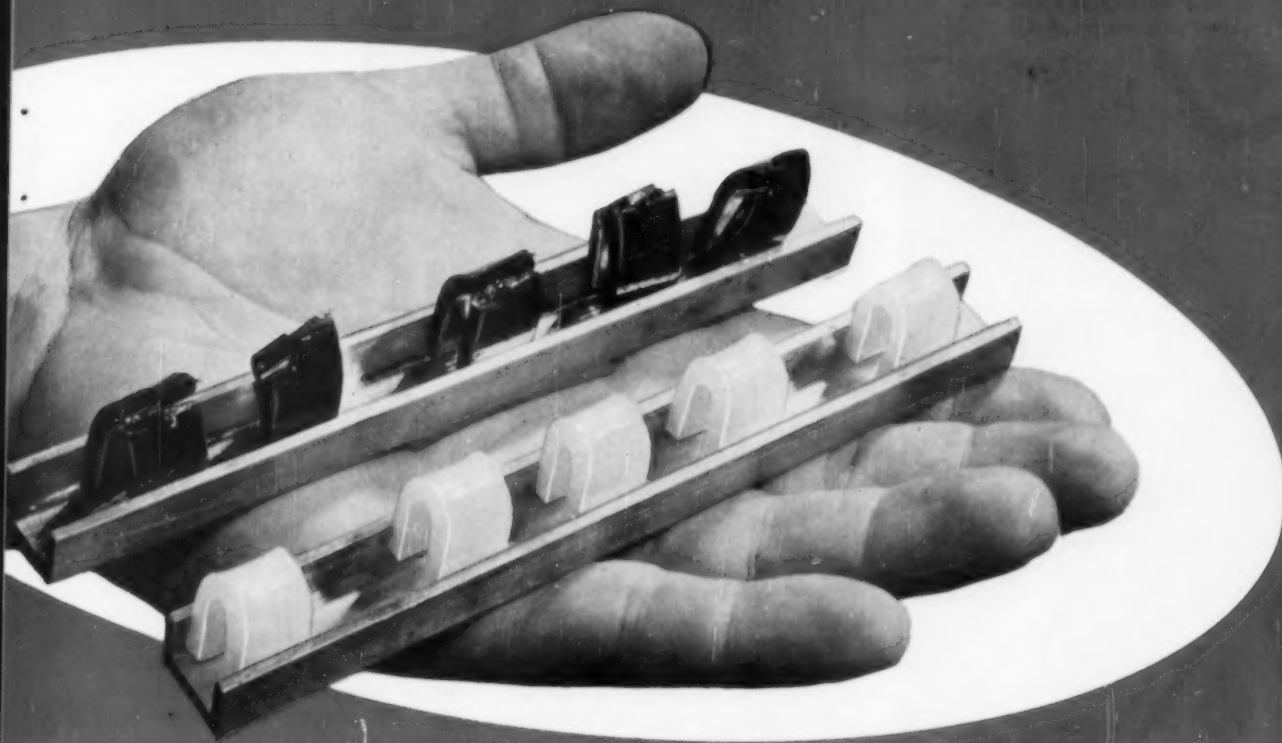
GEON polyvinyl materials • HYCAR American rubber and latex • GOOD-RITE chemicals and plasticizers • HARMON colors

MODERN PLASTICS

VOLUME 33

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SEPTEMBER 1955



Courtesy Koppers Co., Inc.
Test strips of conventional (black) and low-pressure (white) polyethylene were bent and soaked in a detergent for several days. The low-pressure material was unaffected by this treatment but the strips of conventional material cracked at the bonds.

POLYETHYLENE Grabs the Spotlight

First of two articles surveying the polyethylene situation,
especially as it will be affected by new production methods

SPAKED by news of the emergence of new varieties, new producers, improved resins, and ever-increasing markets, polyethylene is far ahead of all other plastics materials as the chief attention getter in the surge toward new heights.

Announcements by Phillips Chemical Co. and Koppers Co., Inc. that they were in pilot plant production of so-called low-pressure polyethylenes; the molders' rush to try out Eastman Chemical's new "soft" or high melt-index material; Du Pont's apparent conquest of previous production difficulties and introduction of various types, each suited for a specific end use; Spencer Chemical Co.'s feat of coming into production so early in the

Extruded film made from low-pressure material is in the development stage

Cylindrical polyethylene bottles make excellent containers for powder

Courtesy Bakelite Co.



Courtesy Eastman Chemical Products, Inc.
Leakproof funnel, molded of polyethylene in one piece, won't dent or rust, is resistant to most acids



Courtesy Phillips Chemical Co.

game; U. S. Industrial Chemical Co.'s implied guarantee of uniform batch delivery; Dow's announcement that they are now in commercial production; the W. R. Grace announcement that they have taken out a Phillips license; Monsanto's indication that they are working on three different methods of manufacture; and Bakelite's serene confidence as expressed in their oft-mentioned statement that they intend to stay ahead of the pack have all contributed to making polyethylene the most talked about plastic in existence today.

A great portion of the talk revolves around so-called low-pressure polyethylenes. The unusual angle is that not a single large-volume, commercial, low-pressure plant has been built in the United States, although Phillips is starting such a project in Pasadena, near Houston, Texas, and the Koppers' operation is beginning to assume the dimensions of a small commercial plant. Not even in Germany, where the Ziegler (low-pressure) type of polyethylene was born, is there any evidence that a commercial plant is actually in production, although plans have been made for several. There are at least eight pilot plants

now producing or about ready to produce either Phillips or Ziegler type materials in the United States. There may be more under wraps. In addition, there are various other companies working on low-pressure polyethylene projects without a license from either Phillips or Ziegler. Their work, of course, is held secret and cannot be detailed here.

Nomenclature of the new materials is also a point of great confu-

Two related articles, of which this is the first, will preview the impending emergence of new types of polyethylene as a potent factor in the plastics industry of the future. They will also constitute a round-up of what's going on today in polyethylene, with particular attention to the improved materials now available in conventional polyethylene and what they are being used for in this year of 1955.

This first article is devoted almost entirely to so-called low-pressure polyethylene. The second article, to be published in the October issue, will review the progress of high-pressure polyethylene over the past 12 months.

sion. Koppers and Phillips object to "low-pressure" as a descriptive term. They contend that no user cares how the material is made—that he is interested only in how it performs; therefore, they hold, why confuse him with the erroneous implication that perhaps it molds at low temperature. Furthermore, Phillips insists that its material has different properties than the Ziegler process material and doesn't like the idea of bracketing it in that classification.

Up to now, the so-called low-pressure polyethylenes have also been termed high modulus, high density, high molecular weight, linear, high heat resistant, high temperature, and Ziegler and Phillips polyethylenes.

Modulus, in effect, means stiffness and the term high modulus differentiates the new from conventional polyethylene which is less stiff.

Density is mass per unit volume. The new materials range from 0.93 to 0.96 g./cc., compared with 0.911 to a fraction over 0.92 for the old.

Molecular weight and molecular structure do not mean much in actual understanding to anyone except a chemist, but they have a significant bearing on the characteristics of polyethylene. In general they describe a degree of hardness ranging from waxes to horny solids. But

the average user isn't going to give a hoot about such things as long as he gets a material with the properties best fitted for his type of product.

Linear polyethylene means roughly that the molecules lie in a straight line and are packed closely together, with a limited number of branches dangling from the main line. Linearity is closely associated with density and crystallinity.

The meaning of heat resistance and high temperature is obvious. All the new polyethylenes are unaffected by heat up to 250° F. or slightly higher. Traditional polyethylene is subject to distortion if boiled. The new polyethylenes would thus become the highest heat resistant thermoplastics in general use, except nylon and fluorocarbons.

There are many claims and counterclaims about the heat distortion of all polyethylenes. Babies' milk bottles made of traditional polyethylene can be immersed in boiling water if not left too long or if not permitted to touch the side of the metal container. Phillips asserts that its material will not deform at 260° F. and that heat resistance increases according to the degree of crystallinity of the polymer. Obviously, the heat resistance depends upon many conditions, but the important fact is that the new material

has a surprisingly high heat resistance and will easily withstand sterilization. Of course, this doesn't mean that it will not burn or melt if it comes in contact with a flame.

The names Phillips and Ziegler as used in the above paragraphs refer, of course, to Phillips Chemical Co., a wholly owned subsidiary of Phillips Petroleum Co., Bartlesville, Okla., and Prof. Dr. Karl Ziegler of Germany, both in control of various patents related to production of these new polyethylenes.

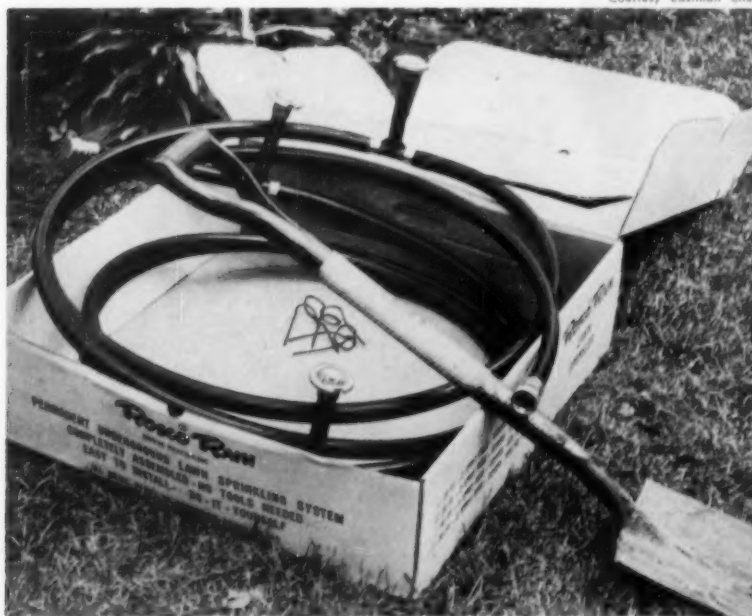
Catalysts are the Key

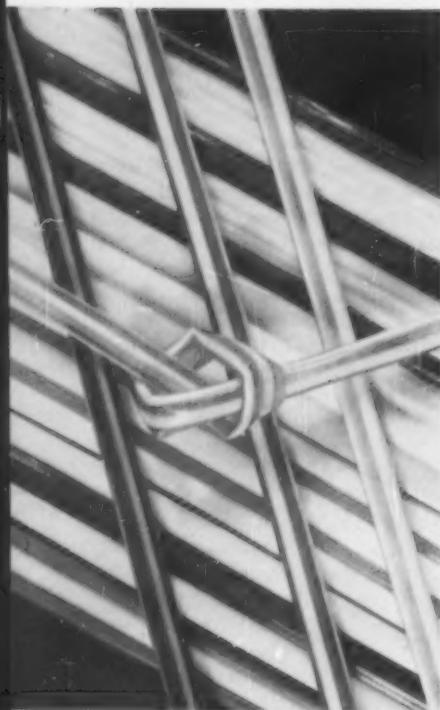
The low-pressure name was hung on these materials because of the sensation created when it was discovered that ethylene could be polymerized with pressures of 500 p.s.i. or less. As more knowledge became obtainable, it was obvious that the new catalysts used for polymerization were the key to the various so-called low-pressure processes. Oxygen is used as a catalyst in the conventional polymerization methods, but it doesn't eliminate the need for high pressure.

Apparently, the new catalysts were developed almost simultaneously by Phillips and Ziegler, but both assert that they are using different materials. Many patents relating to this new process have been

Flexibility of the polyethylene tubing used in lawn sprinkler system for do-it-yourself installation permits delivery of completely assembled unit in compact container (left, below). System, tested before burial (below, right), is unaffected by temperature changes

Courtesy Eastman Chemical Products, Inc.





Courtesy E. I. du Pont de Nemours & Co., Inc.
Knot demonstrates flexibility and toughness of multi-colored tubular extrusions of polyethylene, used for sipper straws

Translucency of polyethylene collapsible tubes shows off the colors of the finger paints which they contain

Courtesy Bafelite Co.



applied for and some have been published, but the key patents have not yet been issued. Both parties contend that the know-how and additives necessary in using the catalysts are just as important or more so than the catalysts themselves. The Ziegler process reputedly uses aluminum and other metal alkyls in a solvent. When it is filtered, the residue, which is polyethylene, drops out with a bit of catalyst and low molecular weight polymers left. The Ziegler trick is to get the impurities out, according to some technicians.

According to a Belgian patent issued to Phillips, its method uses a catalyst composed of chromium and aluminum oxide and other materials in a solvent. Theoretically, the solvent must be evaporated. Phillips spokesmen emphatically insist that the Belgian patent does not tell the whole story. Apparently, there is a host of possible catalysts. Phillips is noted in the petroleum industry as a company with outstanding polymer chemists and solvents experts. They have been at work on this new catalyst development for about 10 years; they seem confident that they can produce the same or even a better product in a commercial plant

than they are now producing in a pilot plant. Furthermore, they expect to use their catalysts for polymerization of other materials that will eventually lead to large-scale production of resins and chemicals.

The Ziegler Angle

Prof. Dr. Karl Ziegler is associated with the Max Planck Institute at Muelheim, Germany, which is financed primarily by 20 to 30 Ruhr companies that are interested, among other things, in the study of coal chemicals. Dr. Ziegler's discovery that ethylene could be polymerized without high pressure was an incident in his work on catalysts, the significance of which has not yet been totally understood but is probably even more epoch-making than the polymerization of ethylene.

The Ziegler and Phillips catalysts are expected to open up a whole new field of catalytic chemistry particularly adaptable to the petroleum industry. Chemists say that the new catalysts open up the "heterogenous phase" of polymerizing thermoplastics, as differentiated from the classical homogenous catalytic phases. The new methods are especially adaptable to polymerization of addition polymers, such as vinyls (all types except chloride and acetate), styrene, propylene, and butylene, and for use with other olefins and alcohols, and in the new oxo process. Copolymerization of ethylene and other materials is also an in-



Courtesy Koppers Co., Inc.

Low-pressure material does not break at 575 % elongation; conventional breaks at 200 %

Molders of a diversity of products are interested in the new polyethylenes



Courtesy Koppers Co., Inc.

triguing possibility. Montecatini is believed to be trying out this process to produce polystyrene with a melting point of somewhere near 390° F. and is also said to have an exclusive license for producing Ziegler process polyethylene in Italy. Among that company's consultants is Prof. Giulio Natta of Milan Polytechnic Institute, an expert in this phase of chemistry.

How Much Will it Cost?

Cost of the polyethylene to be made by the Ziegler process is by no means determined as yet. Early rumors that it would be unusually low in cost seem unfounded. The original plant cost will be less than the conventional high-pressure facilities, but getting the catalyst, solvent, and "grease" or low molecular weight fractions, out of the polymer is not a particularly low cost operation; indeed, it may be a big stumbling block when commercial plants start production. Koppers has announced a price of 43¢ a lb. for its present material, which is 2¢ over current prices for regular polyethylene molding material and the same as current prices for film resin. The company makes no predictions on price structure for the future, except

that 43¢ is a realistic price for large-scale production.

Phillips has implied that its prices will be higher than conventional polyethylene on the theory that it is a higher quality item and molders will require less material because they can design for thinner walls than with present polyethylene.

Molding Requirements

Molders are particularly interested in the possibilities of the new low-pressure polyethylenes. Improved stiffness is the angle that fascinates most of them. The stiffness apparently makes little difference in handling. The only difference is a requirement for 50° F. more heat in the cylinder. Sample batches of Koppers material have been molded at a rate of 8 shots a minute, which is comparable to styrene.

Natural color has been improved considerably since the first samples came out, and the tendency toward yellowing shown in some cases has been overcome. Such discoloration may possibly have come from troubles in eliminating the impurities. Another claimed advantage of low-pressure over high-pressure polyethylenes is better gloss or finish. Shore D hardness of the low-

pressure materials is claimed to be about 65 to 70 in comparison to 41 to 48 for high pressure. The hardness of low-pressure polyethylenes approaches that of nylon. Gears and bushings similar to those molded from nylon have been molded from low-pressure polyethylene to show what can be done with it. Incidentally, it is possible to make these new materials so hard that they can't even be fused in a Banbury mixer.

Larger moldings are a possibility, too. Washing machine agitators are being experimentally molded, but it must be remembered that washing machine engineers try everything and love to try new things. It seems probable that a new design would be needed for a polyethylene agitator because of the concentrated stress at the hub. Present polyethylene has a low yield; that is, if stretched too much, it doesn't come back and might be impractical in a washing machine hub as it sometimes is in bottle caps where it overrides the threads. However, the tensile or "pull" strength of low pressure is much greater than conventional polyethylene.

An automobile steering wheel is an example of where the new poly-



Courtesy Bakelite Co.

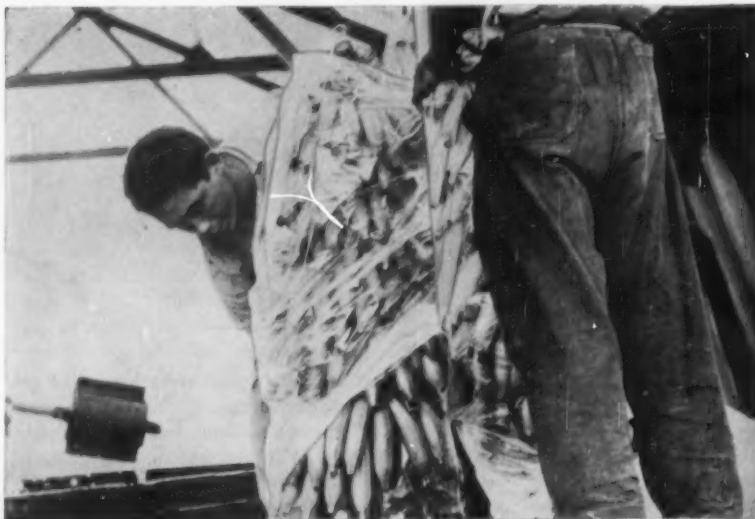
Polyethylene basins, made in a variety of sizes and shapes, are becoming more and more popular for a multitude of uses in the kitchen and the nursery

ethylene properties fit. The materials resist heat or cold, have great strength, surface hardness, and excellent finish. Battery cases are another possibility where more stiffness is desirable. In housewares there will be many places where low-pressure polyethylenes will overlap on present material, but there are also scores of present molded items that are superior in the present polyethylene.

In the packaging industry where users are seeking containers, boxes, bottles, and carboys that will have chemical inertness, rigidity, and impact strength, the new polyethylenes could answer the quest for a material that lies between polystyrene and conventional polyethylene. As a molding material, the new polyethylenes will create a much broader base within which molders can operate and may also invade the cellulosic and high-impact styrene fields.

Bottle molders are particularly smitten with the possibilities of low-pressure polyethylenes. Again it is a case of broadening their base, for so far there is none of it around flexible enough to use for a squeeze bottle. Rigidity and heat resistance are the primary factors involved. A nursing bottle that can be boiled without danger of distortion would be a great boon to mothers and hospitals. Perhaps even a returnable milk bottle is a possibility.

The food processing industry is also interested. Bottles for soft drinks are a hoped-for possibility. Less permeability for essential oils and gases is also a possibility of low-pressure polyethylenes due to increased crystallinity or density. But



Courtesy Bakelite Co.

this last is a tricky one—no one can be sure as yet just how effective this property is going to become.

For Extrusion

Low-pressure polyethylenes for extrusion are handled the same as present polyethylene, except that a higher temperature is required in the barrel. Pipe thus produced will be stiff, cannot be coiled, and thus won't compete with today's polyethylene pipe; but it is likely to move into fields where other plastics are now involved, such as in chemical plants.

Film produced from sample lots of low-pressure polyethylenes has created considerable controversy as to its prospective use. It is somewhat more clear than present high-pressure polyethylene film, but the latter is improving in clarity at a great rate. The low-pressure film is a bit stiffer and has a slight tendency

to be "tinny" or "crispy," but enthusiasts say that a thinner film can be used and that the slight stiffness is an aid in pushing it through some packaging machines.

Koppers is exhibiting a film with a non-blocking surface—so smooth that it even slips on a surface winder. It can be printed after flame treatment. The cementing problem remains as it is with regular polyethylene, but ordinary heat sealing can be accomplished by raising the temperature of the sealing bar about 50° F.

However, it is known that highly crystalline material such as the low-pressure polyethylenes are subject to fracture under impact, and further data must be established before performance of film can be evaluated. Low-pressure producers say that there will be no trouble when the film people learn to handle the new material.

Both Koppers and Phillips state that their film samples have been made from regular molding material grade—that they will later have improved film grades just as do present resin producers.

It is obvious that if film made from low-pressure polyethylenes should prove practical, its lower permeability, greater grease and heat resistance, and perhaps stiffness, would be a boon to film users. For example, food might be sterilized in a bag after loading, and "crispy" film would be ideal for potato chips, pretzels, etc. It might even be used, in heavy gages, in a manner similar to glass and tin for packaging. There should be no insurmountable problems in handling it on a vacuum forming machine.

Despite all these possibilities, there is as yet no majority feeling that low-pressure polyethylene film will supersede the high-pressure material. The flexibility of the latter is one of its greatest properties, and although the new material can be transformed into a relatively soft, flexible item, there is still a feeling of "wait and see" before anyone goes all out for the prospective new film. Because of wide differences in

properties and the fact that they are mutually soluble, some interesting possibilities of mixtures of high- and low-pressure material exist.

Wire Coating

There has not yet been much testing of low-pressure polyethylene for wire or cable coating. Its electrical properties are comparable to high-pressure material, but there are other considerations. Its superior abrasion and heat resistance would undoubtedly broaden its uses—perhaps even to include high power lines.

The abrasion resistance is comparable with nylon. In one abrasion test, the polyethylene was subjected to a 40-lb. pressure sand blast; there was no penetration, although the surface was roughened. On the other hand, it is claimed that abrasion tests indicate that low-pressure polyethylene will *not* swallow particles as does nylon and has a tendency to fail on heavy-load abrasion.

Still another barely explored field is paper coating, but the new material would seem to have possibilities. A very thin coating could be used because of strength; its grease resistance and low moisture and gas

permeability would add valuable properties to paper, and its stiffness could possibly reduce the weight of paperboard required.

No Commercial Production Yet

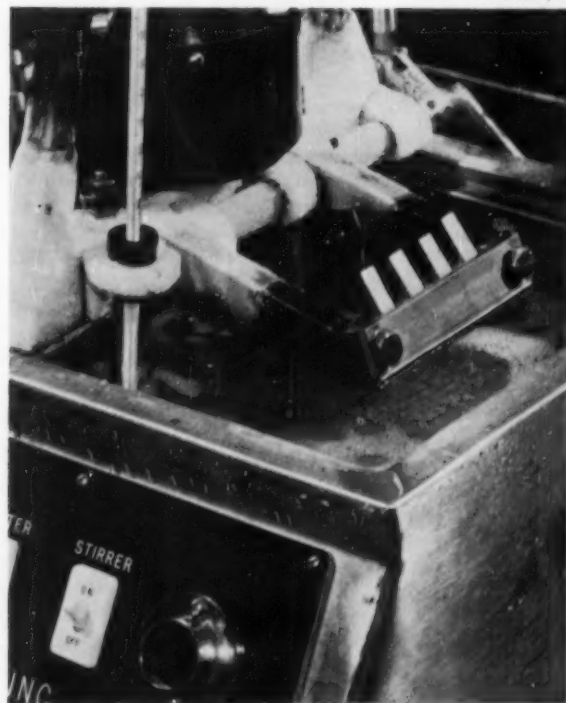
It might be well to reiterate at this point that all of the present discussion of low-pressure polyethylenes concerns materials not yet produced on a commercial plant scale. Everyone in plastics knows that the gap between pilot plant and commercial plant is generally difficult to bridge. Polyethylene in particular has exhibited cantankerous tendencies in nearly all production plants. Purifying the ethylene is one problem. Uniformity is another. Molders and film producers still complain about variations from batch to batch. The amount of below-grade resin has been abnormal at times. It is reasonable to believe that low-pressure material plants will run into similar difficulties.

Then there may be such problems as toxicity or odor or some other handicap (none has appeared as yet) that would block the materials off from certain large markets. There isn't much doubt but that some day they will be produced in

Under test, thin bars of low-pressure polyethylene are unaffected by impact at -78.5° F. Conventional material shears off under same test

Steam sterilization had no effect on low-pressure polyethylene plates but reduced similar objects of conventional material to shapeless masses

Courtesy Koppers Co., Inc.



commercial plant quantities, but advance planning on the part of users should be cautious until a guaranteed supply is at hand.

Furthermore, there is presently no indication that low-pressure is going to drive high-pressure polyethylene out of competition. The low-pressure polyethylene is essentially just another plastic and many chemists believe it should even be called by some other name than polyethylene. True enough, it will overlap on other thermoplastics to a considerable extent, but primarily it is expected to broaden the base for plastics applications. One probable result will be the blending of high- and low-pressure polyethylenes to obtain tailor-made materials with special properties.

Attention should also be called to the vast improvements being made in high-pressure polyethylene almost every week in the year. Great progress has been made in improving the resin for every purpose. Better control of polymerization temperatures and pressures has resulted in a degree of controlled variation in the resin so that the producer can tailor it to fit the particular need of his customer. Even without the spur of the new low-pressure polyethylenes, the polyethylene of tomorrow would have been far superior to that of yesterday. It could still be the first billion pound plastic even if the low-pressure materials had never been discovered.

A producer gives the following in-

teresting prognostication of what the two polyethylenes' volume might amount to in 1960:

| | High Pressure In millions of lb. | Low Pressure In millions of lb. |
|--------------|-------------------------------------|------------------------------------|
| Bottles | 100 | 50 |
| Coatings | 70 | 30 |
| Film | 300 | 30 |
| Molding | 100 | 50 |
| Pipe | 70 | 30 |
| Wire coating | 75 | 10 |
| | 715 | 200 |

Future Plans

Plans of the various companies in the polyethylene field, so far as they are available for publication, are as follows:

Phillips Petroleum Co. has announced that construction of a 145 million-lb. ethylene plant at Sweeny, Texas, near Houston, has been started. The first section of the polyethylene plant at Adams Terminal near Pasadena on the Houston ship canal is scheduled for completion so that polyethylene will be available in the second quarter of 1956. Total capacity by the end of 1956 should be 110 million lb. or more.

The company is also licensing prospective producers and furnishing engineering know-how. W. R. Grace & Co. is the first. Several more prospects are in view but no announcement has been made yet as to conclusion of further arrangements.

Phillips objects to being put in the same classification with producers using the Ziegler process. The company claims that it uses different catalysts, different temperatures, and different pressures. The firm lays great stress on crystallinity of its material which it asserts will assure better properties. Crystallinity may be described as similar to a brush pile with the branches laid parallel and held close together. That is the structure of linear or low-pressure polyethylene. High-pressure polyethylene is branched. The branches prevent close alignment of the molecule chains and would be akin to the aforementioned brush pile with the branches tossed together at random.

The company is now concentrating on Marlex 50, which is the first of a family of Marlex polymers. Later they will have other grades with

(To page 210)

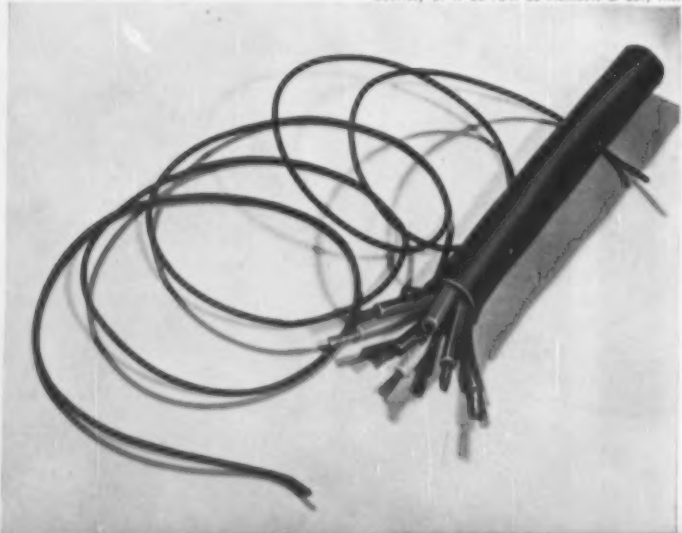


Courtesy E. I. du Pont de Nemours & Co., Inc.

Clever design, plus properties of polyethylene, made possible these covered food containers which will not leak, even if turned upside down

A substantial portion of polyethylene production is used as insulation in electronics, including wire coating. See tabulation at right, above

Courtesy E. I. du Pont de Nemours & Co., Inc.



Disneyland

in Miniature

RAPID progress in vacuum forming of thermoplastic sheet materials is revolutionizing the manufacture of many types of interior and store window displays. This fact is dramatically demonstrated by a coordinated group of "Disneyland in Miniature" displays developed by W. L. Stensgaard and Associates, Inc., pioneer Chicago firm in this field.

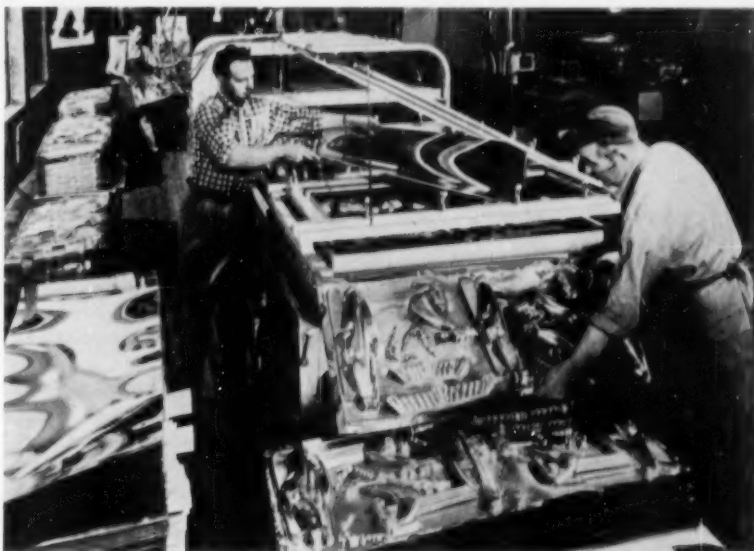
These displays will make their appearance this fall in stores throughout the country as part of what is perhaps the most comprehensive tie-in merchandising promotion ever staged. Timed to capitalize upon the publicity attending Walt Disney's fabulous new Disneyland amusement park and educational center at Anaheim, Calif., which opened on July 18, the displays will recreate, in reduced scale, many of the leading features of the \$17 million play mecca—including highlights of "Tomorrowland," "Fantasyland," "Frontierland," and "Adventureland," and the fascinating characters which inhabit them. The displays are designed and constructed to afford retail stores wide latitude in using them for special merchandising promotions during the coming Christmas season.

Visual Appeal

The Stensgaard organization was licensed by Walt Disney Enterprises to develop and produce the numerous individual displays which comprise "Disneyland in Miniature." In size, realism, and sheer visual appeal, these displays mark an important new milestone in the merchandise presentation field. And many of the most noteworthy effects would have been almost impossible to achieve—at least without exorbitant cost—by any other means than the use of vacuum formed plastics.

Through the extensive use of vacuum forming, in conjunction with other fabricating techniques involv-

Plastics sheet forming, decorating, and machining techniques are coordinated to produce dramatic merchandising displays



Two operators remove formed metallized sheet for use in Disneyland-in-miniature displays from two-table vacuum forming machine, while third (center) places blank sheet in frame

Skilled wood carvers produce many of the original display models. When circumstances permit, these carvings, drilled with vacuum holes, may be used as sheet forming dies





Cast phenolic molds, prepared from original wood carvings, are stripped, mounted on plywood, drilled for vacuum holes, and otherwise readied for vacuum forming operation



In production of cast phenolic die, worker pours liquid resin into prototype female mold . . .



. . . After cure, male mold is stripped from cavities, mounted, and drilled for vacuum openings

ing foamed styrene, fabrics, etc., Stensgaard has produced a coordinated family of Disneyland characters and "props" which has caused even seasoned display experts to wax enthusiastic. Many of the outstanding display components were made possible through the use of one of the largest vacuum forming machines in operation up to the present time. This huge machine has dual 60- by 90-in. platen areas and is equipped with a high-efficiency blower system for more rapid cooling cycles. With it, Stensgaard is able to turn out vacuum formed parts of exceptional size, as well as multi-cavity work involving a large

number of individual units. For example, the sets of molds used in producing the horses for a miniature carousel turn out 18 of the horses at each molding cycle—and each figure measures approximately 7 in. high and 9 in. long.

In order to obtain the wide range of color effects used in the various components of the Disneyland project, Stensgaard employs several different approaches. Where metallic finishes are required, parts are vacuum formed from metallized sheet stock. In some instances, spray painting of the plastic units after forming is used to obtain special color effects. On other parts, the

plastic sheet stock is silk screened with the necessary colors and designs in distortion, prior to forming. By forming a prototype part with a plastic sheet which has been divided into a series of squares, the amount of "stretch" which takes place in different parts of the piece is determined and the printing pattern is determined accordingly.

Ideally Suited

Vacuum formed sheet plastics are ideally suited to this type of display work. The design latitude of these materials enables the display manufacturer to achieve an almost limitless variety of effects at relatively



Three sets of molds with a total of nine cavities for forming heraldic shields for use in decorating miniature carousel (left) are mounted at one end of vacuum forming machine





152 IN.

Vacuum formed Casey, Jr. train, with Disney characters aboard, makes arresting merchandising display. Train is animated and decorated in bright colors for optimum effectiveness. Use of vacuum forming makes such elaborate displays economically feasible

low cost. Tooling up is fast and economical—an important factor since timing is often vital in the success of store displays. These units frequently tie in with special holidays or seasonal promotions and the manufacturer must be able to go into production without delay as soon as designs have been set.

Extremely light in weight, the vacuum formed plastic units are easy to handle and economical to ship. Often they can be nested to achieve further shipping economies. The durability of the plastic sheet materials enables them to withstand normal handling and shipping without damage. Because of their flexibility, they endure twisting, dropping, and other stresses which would quickly damage parts made of plaster, papier-mâché, and other materials traditionally used in display work. Store display men like to work

with the formed plastic parts because they can be set up quickly with only a lightweight, concealed supporting structure and they can be fastened in position with small nails or pins. Easy cleanability of the plastics parts insures attractive appearance at all times.

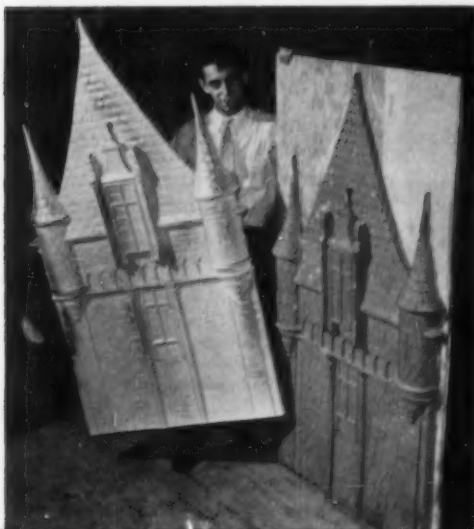
Before beginning to work with formed sheet plastics several years ago, Stensgaard used papier-mâché in the construction of many displays. Largely a hand operation, this process involves the creation of an original female plaster mold into which paste-saturated paper is placed in small sections, gradually building up to the finished part. Usually it was necessary to leave the work in the mold at least overnight, exposed to a temperature of 200° F. or more in an oven, before it could be removed from the mold. This limited production to one piece per day per mold—



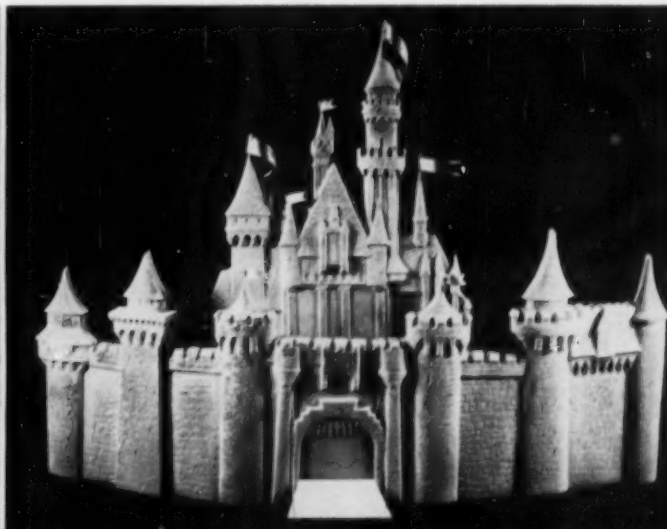
6 FT.

Dumbo display is fabricated of styrene foam covered with layer of Celastic

Section of Enchanted Castle (left) is 33 in. wide, 65 in. high, was formed on cast phenolic die at right



Another Enchanted Castle display produced by vacuum forming illustrates realistic effects possible (e.g. stone walls) with relatively low tooling costs



30 IN.



Replicas of Dumbo and Timothy Mouse are vacuum formed in two halves which are then cemented together to form the complete character. Figures of Dumbo measure 24 in. in length



In finishing large structures fabricated from blocks of foamed styrene, layer of Celastic is used as an outside surface that can be readily finished in any color

Multiple-spindle automatic carving machine can produce as many as 18 carved heads from foamed styrene blocks. After forms are carved, they are decorated and finished (see Mickey Mouse head)

All illustrations with this article courtesy W. L. Stensgaard and Assoc., Inc.



and the parts required extensive finishing operations. For full-round objects, made by assembling two matching halves, producing a strong, inconspicuous joint presented another time-consuming problem.

Rapid Tooling

By way of contrast, in working with the vacuum forming process, Stensgaard is able to tool up rapidly and to get fast production of finished parts from each mold. Molds are made in the Stensgaard plant, using several types of materials and techniques according to the production requirements of the job. The object to be made in plastic is usually created in wood or modeling clay. A number of skilled craftsmen, including some of the nation's finest wood sculptors and artists, were instrumental in producing the original models for the Disneyland exhibits.

In some instances, where the design permits and multiple molds are not required, the original wood carving may be used for the sheet forming die, after being drilled with vacuum openings. A large percentage of the Stensgaard molds, however, are made of cast phenolic. When the original is produced in clay, it is customary to make an intermediate plaster female mold into which the casting phenolic is poured and cured.

Another interesting technique, which demonstrates the versatility of the sheet-forming process, involves drilling the original wood master with vacuum holes, drawing a sheet plastic prototype over this original, then inverting the plastic shell and utilizing it as a female form into which the liquid phenolic material for the final male mold is poured. Although the cast phenolic material, with added accelerator, will harden in approximately 8 hr. at room temperature, customary practice at Stensgaard is to subject the casting to a temperature of between 150 and 200° F. overnight to prevent creeping during cure. Using the plastic prototype technique, as many duplicate molds as necessary can be quickly produced. These are then drilled with vacuum holes and mounted on a plywood base, ready to be placed in the vacuum forming machine.

Several types of sheet plastic materials are used by Stensgaard in
(To page 216)

Plasticizer Production, 1954

PRODUCTION of all plasticizers in 1954 amounted to 301 million lb., compared to 293 million lb. in 1953, according to the U. S. Tariff Commission figures which are presented in the tabulation below.

The 1954 statistics fail to depict any great volume change over 1953 in the type of plasticizers used with vinyl chloride resins. The small increases noted were, generally speaking, across the board and tied in with

the vinyl resin increase in 1954 over 1953. The old reliable D.O.P. and the phosphate plasticizers led the pack as usual, the former with a 3 million-lb. increase, the latter with little less than a million-lb. increase.

United States Production and Sales of Plasticizers*

| Chemical | Production 1953 ¹ 1,000 lb. | Production 1954 1,000 lb. | Sales | | Unit ² Value Per lb. |
|--|--|---------------------------------|-----------------------|------------------|---------------------------------------|
| | | | Quantity 1,000 lb. | Value \$1,000 | |
| GRAND TOTAL | 292,898 | 300,674 | 247,445 | 81,997 | \$0.33 |
| PLASTICIZERS, CYCLIC | | | | | |
| Total | 223,810 | 227,618 | 185,781 | 56,993 | 0.31 |
| Phosphoric acid esters: | | | | | |
| Tricresyl phosphate ³ | 22,109 | 23,847 | 24,553 | 7,740 | 0.32 |
| Triphenyl phosphate | 7,418 | 6,426 | 3,454 | 1,255 | 0.36 |
| Phthalic anhydride esters, total | 165,237 | 170,610 | 134,027 | 40,672 | 0.30 |
| Dibutyl phthalate | 23,280 | 19,876 | 13,897 | 3,685 | 0.27 |
| Dicapryl phthalate | 7,762 | 5,832 | 5,831 | 1,713 | 0.29 |
| Diethyl phthalate | 17,584 | 15,999 | 10,141 | 2,492 | 0.25 |
| Di(2-methoxyethyl)phthalate (Diethyl cellosolve phthalate) | 2,240 | 2,098 | — | — | — |
| Dimethyl phthalate | 2,508 | 2,557 | 2,328 | 508 | 0.26 |
| Dioctyl phthalates, total | 84,813 | 88,224 | 68,423 | 20,550 | 0.30 |
| Di(2-ethylhexyl) phthalate | 51,281 | 54,067 | 41,471 | 12,494 | 0.30 |
| Di-n-octyl, diiso-octyl, and mixed octyl phthalates | 33,532 | 34,157 | 26,952 | 8,056 | 0.30 |
| Octyl decyl phthalate | 8,678 | 10,060 | 9,907 | 3,213 | 0.32 |
| All other | 18,372 | 25,964 | 23,500 | 8,421 | 0.36 |
| All other cyclic plasticizers ⁴ | 29,046 | 26,735 | 23,747 | 7,326 | 0.31 |
| PLASTICIZERS, ACYCLIC | | | | | |
| Total | 60,088 | 73,056 | 61,664 | 25,004 | 0.41 |
| Adipic acid esters, total | 9,177 | 7,037 | 5,177 | 2,390 | 0.46 |
| Di(2-ethylhexyl) adipate | 3,497 | 2,710 | 1,536 | 666 | 0.43 |
| Diiso-octyl adipate | 1,511 | 884 | 1,221 | 552 | 0.45 |
| All other | 4,169 | 3,443 | 2,420 | 1,172 | 0.48 |
| Lauric acid esters | 113 | 55 | 68 | 26 | 0.38 |
| Oleic acid esters, total | 7,952 | 10,085 | 8,007 | 2,675 | 0.33 |
| Butyl oleate | 1,372 | — | — | — | — |
| Glyceryl trioleate (Triolein) ⁵ | 3,214 | 4,054 | 4,237 | 1,123 | 0.27 |
| All other | 3,366 | 6,031 | 3,770 | 1,552 | 0.41 |
| Phosphoric acid esters | 8,534 | 6,122 | 5,571 | 2,439 | 0.44 |
| Ricinoleic and acetylricinoleic acid esters | 4,572 | — ⁶ | — ⁶ | — ⁶ | — ⁶ |
| Sebacic acid esters, total | 5,701 | 6,566 | 5,446 | 3,685 | 0.68 |
| Dibutyl sebacate | 2,186 | 1,950 | 967 | 676 | 0.70 |
| Di(2-ethylhexyl) sebacate | 2,498 | 4,076 | 3,812 | 2,428 | 0.64 |
| All other | 1,017 | 540 | 667 | 581 | 0.87 |
| Stearic acid esters, total | 4,539 | 6,469 | 6,116 | 1,457 | 0.24 |
| Butyl stearate | 2,417 | 3,647 | 3,554 | 730 | 0.21 |
| All other | 2,122 | 2,822 | 2,562 | 727 | 0.28 |
| All other acyclic plasticizers ⁶ | 28,500 | 36,722 | 31,279 | 12,332 | 0.39 |

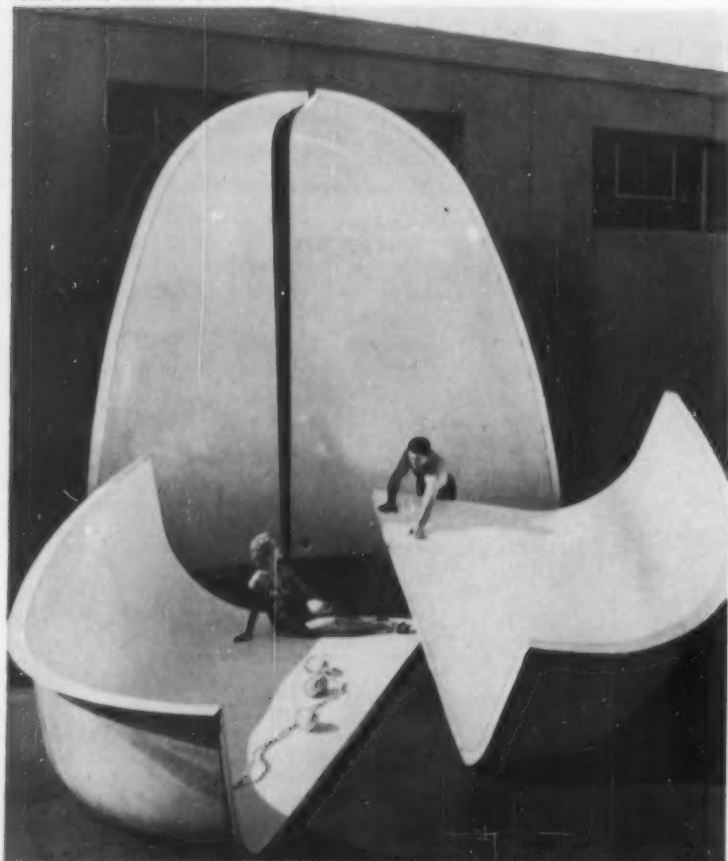
*Source: U.S. Tariff Commission. ¹From U.S. Tariff Commission, as published on p. 109, October 1954 MODERN PLASTICS. ²Calculated on rounded figures. ³Includes data for material reported for use as motor-fuel additive. ⁴Includes data for synthetic camphor, certain phosphoric acid esters, toluenesulfonamides, tetrahydrofurfuryl oleate, and other cyclic plasticizers. ⁵Includes data for material re-

ported for use as a surface-active agent. ⁶Includes data for citric and acetylcitric, palmitic, azelaic, tartaric, and ricinoleic acid esters, and for butyl myristate, glyceryl and glycol esters of certain fatty acids, glyceryl tripropionate, and complex polymeric plasticizers.



Low-cost permanent family pool—as attractive as it is practical—is fabricated of polyester resin-fibrous glass

Photos courtesy Cinderella Glass Pool Co.



SWIMMING POOLS for Mass Markets

To facilitate shipping and installation, pool is fabricated in four separate sections that can easily be joined together on the job. Assembled pool, oval in shape, has an over-all size of 15 by 30 ft.; depth ranges from 3 to 5 feet

Prefabricated in four parts, reinforced plastics pools are assembled and installed at one-third to one-half less than cost of concrete or steel

THROUGH their use in the construction of permanent home swimming pools, plastics seem destined to have a profound influence on the leisure-time habits of the American public. Middle-income families who have long looked upon private swimming pools as luxury items far beyond their means are now being cultivated as a highly profitable market by the makers of such pools. This year, it is estimated that about three times as many pools will be installed as were constructed in 1954.

According to pool manufacturers, they have gone as far as they can, price-wise, with concrete or metal. With plastics, a whole new range of opportunities has been opened. Inexpensive vinyl inflatable pools and pool liners, for example, have already made their mark—and now an attractive 15 by 30 ft. reinforced plastics pool has entered the field with a splash!

Reduced Costs

The reinforced plastics pool that has stirred up so much comment is known as the Cinderella pool and is a product of Cinderella Glass Pool Co., Div. of Paddock of California, Los Angeles, Calif. It is oval in shape, has an over-all size of 15 by 30 ft. and a depth of from 3 to 5 ft., and is molded in four separate sections that are assembled on the site of the installation.

According to the Cinderella company, the polyester resin-fibrous glass laminate pool has many special advantages. As reported by the company, "no other permanent 10,000-gal. capacity swimming pool can compare with 'Cinderella' in beauty, low cost, low upkeep, and value."

As installed, the cost of the Cinderella pool is between \$2500 and \$3000—one-third to one-half less than concrete or steel structures of comparable size. The installation procedure is relatively simple, consisting essentially of bolting the four quarter-sections of the pool together and lowering the assembled unit into an excavation. The short installation time thus required (approximately four days) is not only an extremely

attractive feature for the pool owner but for the pool builder as well. For the same length of time required for a pool builder to install one gunite (a form of concrete) pool, he can set up four to eight reinforced plastics pools. The builder's turnover is thus much more rapid and he can handle a larger volume of business.

Once installed, the outdoor plas-

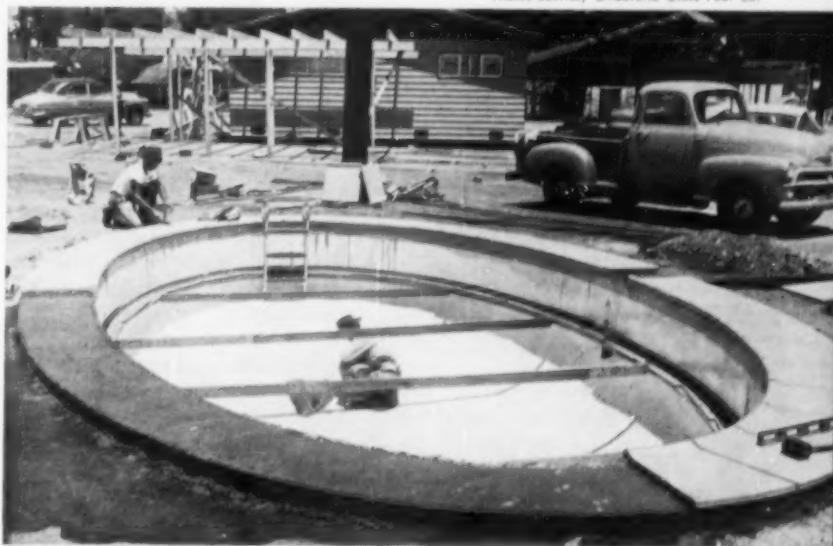
tics swimming pool will last for years under all types of weather conditions. It is strong enough to withstand continuous abuse by bathers, and if it should become damaged in any way, an easy-to-use repair kit containing fibrous glass cloth and polyester resin is available for emergency jobs.

The reinforced plastics pool is also



During installation, pool sections are assembled and bolted together on scaffolding erected over excavation. After removing scaffolding, completed pool is lowered into place

Photos courtesy Cinderella Glass Pool Co.



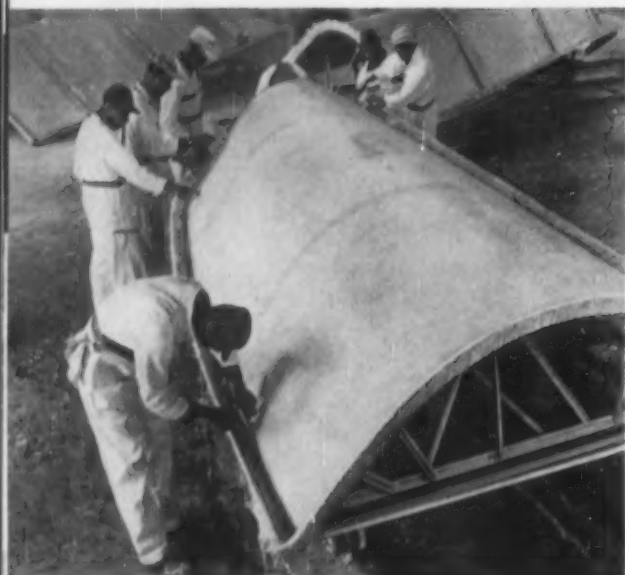
Workmen put final touches on pool; gasketing is applied where the sections join. After a 2-ft. concrete band is poured around the pool, it is ready to be filled

Parting agent is then sprayed over the entire exterior of the male mold

Preparation for molding pool section at the Thermacote plant begins with waxing of mold



Photos courtesy United States Rubber Co.



After fibrous glass materials have been laid up on the mold, liquid polyester resin is manually poured over the lay-up

Before curing at room temperature, extra resin is worked into flanged edge. Mold is mounted on jig running on tracks

non-corrosive and non-permeable. In contrast to the rough surface of a masonry structure, it has a smooth, porcelain-like finish that is completely inert to the chemical agents used in pool maintenance. Under the acid conditions brought on by such agents, the walls of a masonry pool often erode.

Molding Procedure

The four quarter-sections of the pool are engineered to resist all the stresses usually encountered in swimming pool installation practice. Around the top outside perimeter of each of the triangular sections, for example, is molded a reinforcing lip or flange. The flange not only facilitates installation but also lends

added strength to the pool sections.

At the present time, the sections are being fabricated for Cinderella by Thermacote Plastic Products, Inc., Newark, N. J. and by Wizard Boats, Inc., Costa Mesa, Calif. Some fabrication is also being done by Cinderella in their own plant in Van Nuys, Calif.

Because of the unusual size and shape of the parts, special techniques had to be developed by all three companies to make the molding procedure as economical and as efficient as possible.

Pool sections are molded on polyester-fibrous glass laminate or cast epoxy male molds designed and built by Cinderella.

At the Thermacote plant, the sec-

tions are laid up by hand and cured at room temperature, a special catalyst being added to the resin. The actual production begins with the cleaning and waxing of the male mold. A parting agent is then sprayed completely over the exterior of the mold, followed by a gel coat. Fibrous glass fabrics are cut by hand, laid up on the mold, and impregnated with polyester resin.

The exact combination of fabrics and resin which is used is still a closely guarded secret by Cinderella and is described simply as "a laminate consisting of fibrous glass cloth, fibrous glass roving, impregnated beading, and a specially formulated polyester resin."

To facilitate handling and to speed

up production of the parts, six molds are used at one time and each is mounted on special three-wheeled jigs running on tracks.

Curing Oven

The molding technique employed by Wizard Boats, Inc., follows essentially the same pattern with the exception that oven-cure is used.

Because of the size of the sections, Wizard plans to further simplify the curing operation by building a new oven that they claim will be the largest curing oven in the country. When completed, the oven will measure 100 ft. long by 20 ft. deep by 9 ft. high. Eight 12-ft. overhead doors around the oven will open outwards so as not to reduce clearance inside the oven. Supports between doors are hinged and removable to allow entrance of a mold as large as 50 by 20 by 9 ft. high.

The oven, built by Butler Mfg. Co., Los Angeles, Calif., will be constructed of cinder blocks and will be heated by a Thermablock Model 800 circulating gas heater. It will be able to maintain a top heat of 225° F. and will be easily partitioned into smaller sections if required.

With the oven in operation, pool sections, mounted on wheeled jigs for greater mobility, can be rolled directly into the oven after lay-up. The oven will be able to handle eight sections simultaneously (each door will accommodate one pool section) for the 45-min. cure time.

Installation

After the cured sections are removed from the mold, they are ready for installation. Because of the triangular shape of the units, they can easily be nested together to conserve space and crated for either rail or truck shipment. Each section weighs only about 250 pounds.

To install the pool, an excavation is first made to conform to the general shape of the reinforced plastics sections. Scaffolding supported by "A" frames is then placed across the top of the excavation and the pool sections are assembled and bolted together on the scaffolding. After assembly, the scaffolding is removed and the completed pool is lowered into the excavation. When the top flange of the pool is nearly level with the top of the excavated site, the sides of the pool are backfilled. The backfill is brought to within a

few inches of the top of the pool and reinforced concrete is poured around the perimeter.

Trim strips and coping are then positioned around the pool, the pool is filled, the filter unit which had been installed before the pool sections were lowered into the excavation is hooked up and started—and the pool is ready for use.

To date, approximately 400 pools have been installed in some 14 states and results thus far have been excellent. Twenty-two male molds are being used for production at the present time, but the number is ex-

pected to be increased to 32 shortly to take care of demands. Four other models of Cinderella pools have already been designed and should be ready for production in 1956. The Cinderella company feels that this is only the beginning for their revolutionary reinforced plastics swimming pools and that in the future—thanks to plastics materials—more families will be able to enjoy more of the benefits of a life of luxury, without the high cost of luxury.

CREDITS: Fibrous glass materials supplied by Owens-Corning Fiberglas Co.; Vibrin polyester resins by United States Rubber Co., Naugatuck Chemical Div.



At the Wizard plant, a three-wheeled jig specially built to accommodate the large mold is used to speed up production. Molded pool sections are oven cured by Wizard



After removal from the oven, parting agent is peeled off molded pool section and rough spots are smoothed down

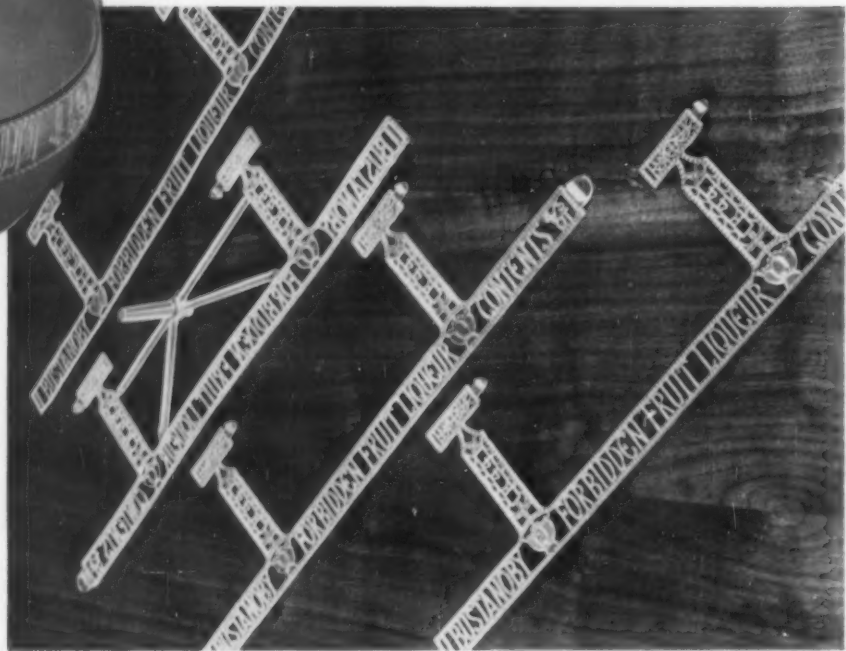
Weighing about 250 lb. each, sections can be nested to conserve space and are easily crated for shipment



Molded



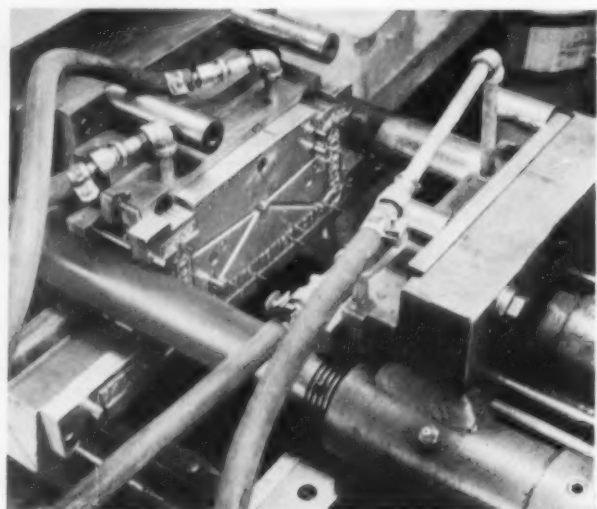
Distinctiveness and display value of liqueur bottle label were retained in switch from metal to molded plastic, per-label cost was cut 50%, and assembly-line delays caused by breakage of die-cast metal locking lugs were drastically reduced



From upper left to right: Die-cast metal label formerly used by liqueur bottler; complete sprue of butyrate molding; label after degating; label with gold-sprayed face



Special "V" type cutter, used in pantograph for engraving label mold, was guided by acrylic templates made from original metal label



Empty mold in open position, showing knock-out pins (lower left and upper center) which produce undercut hooks in finished molded piece

Bottle Label

THE distinctive three-dimensional label used for many years to put bottles of Forbidden Fruit liqueur in a display class by themselves has been switched from metal to plastics—with a 50% saving in label cost and without increasing application time or changing assembly-line procedures.

This unusual label was originally designed as an intricate soft metal die casting which encircled the midpoint of the bottle. It also had two "arms" which extended upward on each side, following the graceful curve of the bottle, and each of these "arms" ended in a strip which could be curved to fit the neck of the bottle. The mid-section band, as well as the neck "collar," were fastened in place by lugs or tongues that were inserted in slots in opposing ends and bent over. These lugs frequently broke during assembly, holding up the production line.

While Forbidden Fruit liqueur is a luxury item, the bottler is still cost-conscious. Thus, when a custom molder suggested the switch to plastics as a means of saving money, an investigation was started that resulted in the perfection of an injection molded butyrate band that does

Replacing metal, three-dimensional decorative butyrate band

produced in ingenious mold cuts cost, looks luxurious

everything the metal band did—plus. Distinctiveness is retained, cost per label has been cut in half, and assembly slow-downs due to breakage have practically ceased.

Locking Method Developed

First step in the change-over was to develop a method of locking the band to the bottle. Three locks were required—one for the center band and two for the collar around the neck. No plastic lug could be bent over as was the soft metal. Consideration was given to a soft metal insert at each locking point, but this idea was abandoned as impractical.

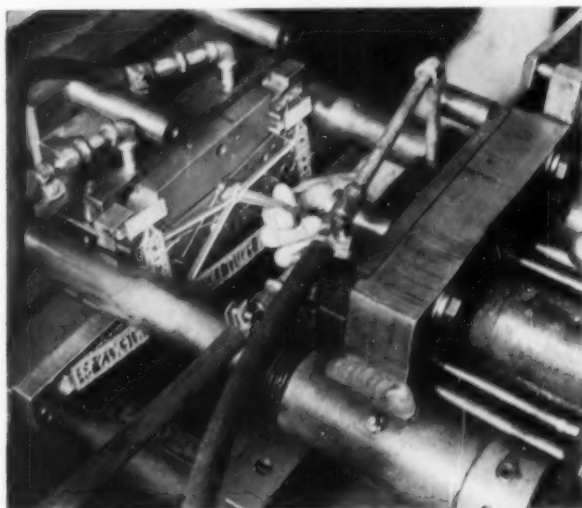
The molder, through long experience with cellulose acetate butyrate, was familiar with the material and particularly with its flexibility, resilience, and toughness in relatively thin sections. On this basis, a hook was designed which, when engaged with a slot in the opposing end, would hold the band firmly around the bottle and could easily be

forced into the slot by finger pressure.

The shape of the hooks necessitated undercuts in the mold. This was taken care of by ingenious mold inserts which were made as parts of three of the knockout pins. These
(To page 222)



Light finger pressure is sufficient to snap final locking hook into place



Machine has just opened and operator has slipped the molded-in hooks of the band label out of the knock-out pins in which they were molded



Photos courtesy Eastman Chemical Products, Inc.

On assembly line, first operator bends band in circle, engages hook in slot, and slips band over bottle; second locks ends of neck band

TOUGH

NEW

INTRODUCED to end-user industries only a little over a year ago, a tough new thermoplastic produced by the Marbon Chemical, Div. of Borg-Warner Corp., is rapidly winning a place for itself in many applications for which its special balance of properties makes it suited.

That term, "balance of properties," is the key to the market acceptance of this material, Cyclocac, which is a thermoplastic polymer containing acrylonitrile, butadiene, and styrene.

In developing the material, Marbon engineers sought a combination of high tensile strength, high elongation, high surface hardness, high impact strength, high heat distortion point, good low-temperature properties, good electrical properties, wide color potential, good permanence properties, good chemical resistance, versatility in application, and ease of processing. The charts on pp. 106-107 show the results of their efforts.

From a performance standpoint, the principal materials with which Cyclocac is expected to compete include vinyl chloride polymers and copolymers, regular and high-impact styrenes, nitrile rubber-resin blends, cellulose acetate butyrate, and nylon. Considerably more expensive than the so-called high-impact styrenes (58¢ to 66¢—depending on quantity—per lb. in powder form and 65¢ to 73¢ in pellet form), Cyclocac is not expected to be used where these materials are presently satisfactory.

This is particularly true in the sheet business, where the sheets are subsequently used for vacuum forming, and for extrusions and injection molding applications where high heat resistance, surface hardness, and high impact strength are not required. Although price-wise Cyclocac is approximately on a par with rubber-resin blends and only slightly above butyrate, its low specific gravity (1.01) makes it quite competitive on a volume-cost basis.

Outstanding Features

Although Cyclocac does not excel competitive plastics in all of the major requirements cited, it ranks

Stroboscopic photo of an RCA radio, housed in a molded Cyclocac cabinet, falling off table onto flag stone floor. Despite the fall and bouncing, rugged cabinet showed no signs of damage

Complete shot of radio cabinet, consisting of front and back halves, being removed from mold at end of cycle. Cabinet is molded in two-cavity mold on 32-oz. injection molding machine

Close-up view of cabinet, before installation of chassis, showing details of the internal design and hinge arrangement used to join the front and rear sections of cabinet together

Top photo—courtesy RCA; center photo—courtesy Santay Corp.; bottom photo—courtesy G. Felsenthal & Sons

THERMOPLASTIC

Containing acrylonitrile, butadiene, and styrene, recently developed material offers an unusual balance of properties

sufficiently high in a number of them to give the aforementioned balance of properties. For example, one of its outstanding features is its combination of impact strength and hardness, as indicated by an Izod notched $\frac{1}{4}$ in. rating of 5.0 and a Rockwell hardness of R90. Tensile strength of the material is 4500 p.s.i. and elongation is 100 percent. The good impact strength of Cycolac is not limited to room temperatures, but persists at reduced temperatures. At 32° F., the impact strength of Cycolac is still approximately 4 ft.-pounds. Even at temperatures as low as -40° F. Cycolac retains an acceptable impact strength.

With its specific gravity of 1.01, Cycolac is one of the lightest rigid materials of any type that can be used for structural applications. On a strength-weight basis, only nylon, with its considerably higher tensile strength, surpasses Cycolac. In the form of a bar 1 ft. long, a pound of the Marbon material will support a load of over 10,000 pounds. The high elongation of Cycolac—contributing ductility, resilience, and high-impact properties—permits relief of stresses from metal inserts, and can also

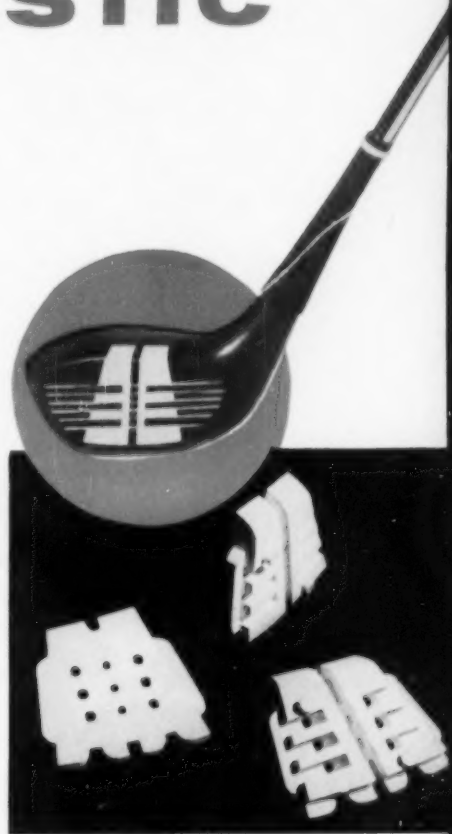
eliminate many failures that might occur where the difference in the coefficient of expansion of the metal and plastic causes stress with a change of temperature. Nails or screws may be driven into finished Cycolac parts without splitting or cracking the plastic.

Strain-Free Parts

The heat distortion point of Cycolac, at just below 200° F., compares favorably with that of competitive plastics. In addition, parts made of Cycolac are generally strain-free and if not under load show practically no tendency to distort, even at temperatures considerably above the heat distortion point.

In most of its electrical properties, Cycolac is only slightly inferior to regular styrene. It is one of the few materials in which electrical properties show no change over a frequency range from 60 to more than a million cycles. There are also indications that there is very little change in electrical resistance of Cycolac with variations in temperature.

In general, Cycolac is resistant to practically all chemicals, with the



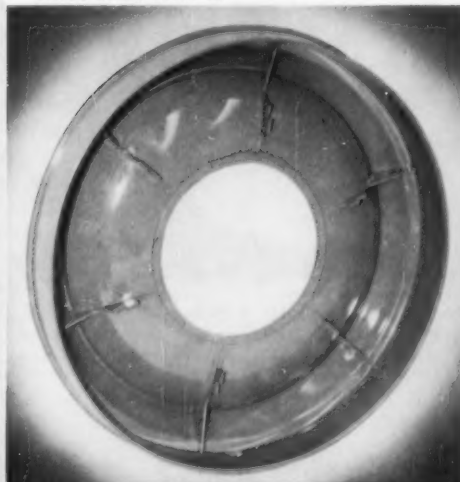
Courtesy Nadco Sporting Goods Co.

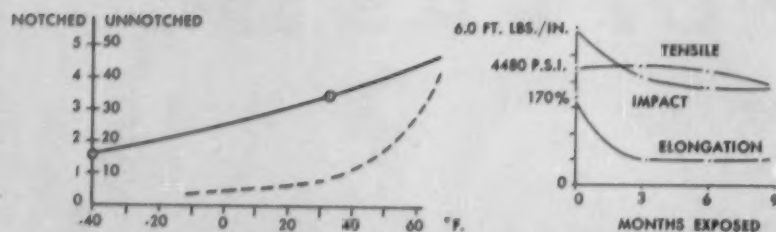
Golf club head is injection molded of Cycolac, using a two-shot technique. Face inserts (three shown above) are designed to permit additional material to flow around part during second mold shot to bond insert to club head



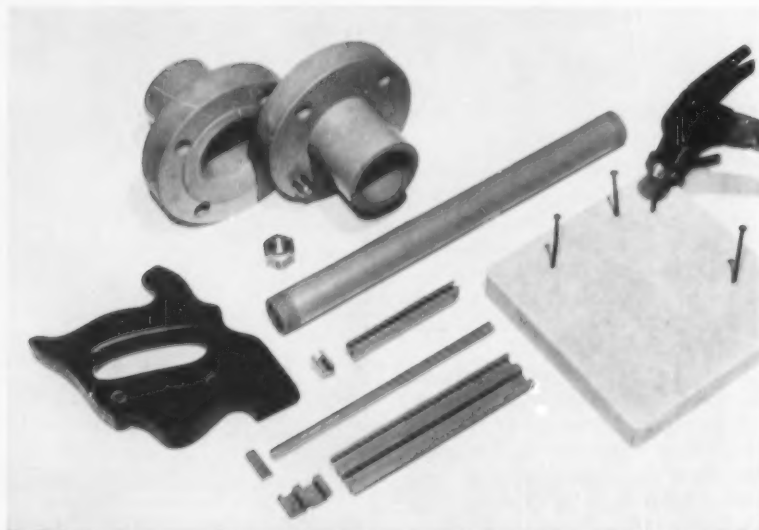
Tank of late-model vacuum cleaner is mounted between large molded Cycolac wheels (arrows). Wheels are made with narrow solid rubber tires (see close-up, below, right) and provide smooth, easy rolling action

Courtesy General Electric Co.





Effect of temperature and outdoor exposure on physical properties of Cycloc



Several products made of Cycloc: heavy-duty pipe joints, showing how pipe can be swaged or flared at ends because of ductility of the material; extruded pipe with threads on each end; saw handles fabricated from thick blanks of Cycloc; extruded sections (foreground) used in several types of sliding screens and windows where self-lubricating properties are important. As shown at right, material will not split when nailed

Exposure tests involving effects of various types of soil and Florida sea water on tensile strength and elongation of Cycloc tensile bars showed no evidence of deterioration. Severe aging in an oxygen bomb at an elevated temperature caused no deterioration of the material's tensile strength, although there was a marked decrease in elongation.

Colors

In its unpigmented form, Cycloc is translucent and a light tan in color. For coloring or pigmenting, a number of standard materials can be used, the selection depending largely on the processing heats which the compound must withstand. For extrusions, the material can be dry-colored effectively by tumble-coating the natural pellets with 0.15 to 0.30% of a wetting agent, followed by tumble-coating with the pigments. The material can also be obtained already compounded and pelletized in many standard colors and, to order, in special colors.

Ease of processing is claimed to be a major characteristic of Cycloc. The material is stated not to give off any toxic vapors and to be non-corrosive to extrusion and molding equipment. Scrap can be reprocessed. Despite the high heat distortion point of Cycloc, it processes at relatively low temperatures. On a two-roll mill, these temperatures may vary from 300 to 320° F. In calendering, the material holds its gage well and it is possible to obtain embossed sheets directly from the calender by taking the sheet off an engraved face roll, or by passing it through a set of engraved embossing rolls after removal from a plain face roll.

Ease of Fabrication

Postforming of calendered Cycloc sheet by vacuum process presents no difficulties. The rapid set-up time of the material makes very short forming cycles possible. Preheating temperatures are approximately of the same order as those required for rigid vinyl, styrene, or acrylic sheeting.

In machining operations, Cycloc can be handled much like non-ferrous metals. It can be worked on a lathe, a milling machine, or mechanical saw, and can be drilled without gumming. Nails and rivets can be used for assembly, and the

exception of concentrated sulfuric acid, concentrated acetic acid, concentrated nitric acid, and various solvents which either attack or dissolve the plastic.

Outdoor Weathering

Studies of the effect of Florida sunlight on tensile strength, elongation, and impact strength of unpigmented Cycloc show that even after nine months of exposure there is practically no deterioration of tensile strength and that the only surface change noticeable is a slight darkening, with no evidence of crazing. There is, however, a drop in the impact strength of the material, tending to level off after a period of about four to five months, and a decrease in elongation, which appears to level off after about three months.



Courtesy General Electric Co.
Television coil form molded of Cycloc provides equivalent performance of nylon forms at 50% of their cost

material can be successfully cemented to itself with a cement made of ketone solvents and Cyclocac. Joints thus made approach the strength of the material within a very short time. The material can also be friction-welded successfully. It also lends itself well to painting, printing, and solvent-polishing when required.

Extruding and Molding

For extrusion operations, normal cylinder temperatures will vary between 350 and 450° F., depending upon the size and shape of the section. It is recommended that cylinder temperatures be gradually raised until satisfactory extrusions are obtained and die swell is low. Die temperatures can then be raised until the material begins to drag on the lands; temperatures should be held just below the point where this takes place.

For injection molding, it is recommended that molding temperatures be kept fairly low. In general, the material will mold well at around 475° F. Although most thermoplastics become more fluid as temperatures are increased, Cyclocac shows this tendency only to a limited extent and molding temperatures above 525° F. should be avoided. The material manufacturer recommends the use of preheating equip-

ment, such as hopper heaters, to speed up molding cycles, particularly for production of large parts.

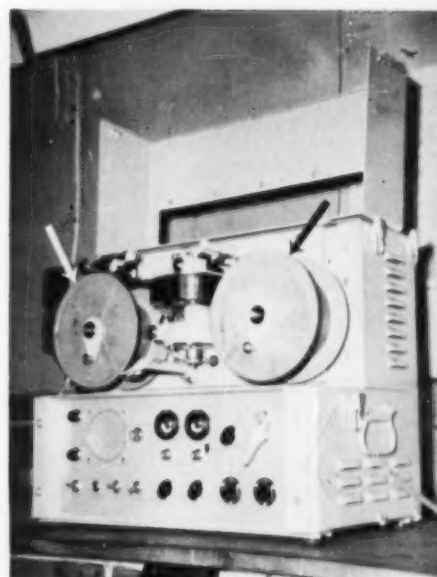
High pressures are also recommended for injection molding of Cyclocac, although molding conditions depend greatly on the part to be produced and the machine used. Mold temperatures should customarily be maintained between 160 and 180° F. for best results. Cycle times are approximately equal to those for molding styrene parts.

Of particular interest to the injection molder is the fact that if any weld lines should occur in Cyclocac parts, they will be as strong as any other portion of the part itself. In addition, the rapid set-up time of the material aids in reducing sink marks on molded pieces having heavy wall sections. The dimensional stability of molded parts is reported to be good, and they are free of molded-in strains.

Typical examples of products and components now being produced of Cyclocac illustrate how the "balance of properties" of this new thermoplastic material are being put to work by various molders, extruders, and manufacturers:

Unbreakable Radio Cabinets

Radio Corporation of America pioneered an important new concept in the portable radio field early this



Courtesy Standard Business Mfg. Co.
Reels on magnetic recorder, molded of Cyclocac material, hold 1000-ft. tapes

year when it introduced five new portable models having non-breakable "Impac" cases molded of Cyclocac by several custom molding firms. Light gray, light green, ivory, dove-gray, and two-tone gray are the colors in which the various sets, priced as low as \$27.95, are available. The cases are so rugged that RCA guarantees them for five years

Properties of New Acrylonitrile, Butadiene, Styrene Material

| Physical | |
|---|---------|
| Specific gravity | 1.01 |
| Izod (ft.-lb./1/4 in. of notch) | 5.0 |
| Hardness, Rockwell | R90 |
| Tensile, p.s.i. | 4500 |
| Elongation, % | 100 |
| Tensile modulus, p.s.i. | 196,000 |
| Compression set under constant load: 22 hr. at 158° F., % | 0.00 |
| Shear strength, p.s.i. | 4100 |

| Thermal | |
|--|-----------------------|
| Heat-distortion temp., °F. | 200 |
| Flammability, in./min. | 1.30 |
| Brittleness temp., °F. | -45 |
| Thermal conductivity, B.t.u./hr./ft. ² /°F./in. | 1.3 |
| Coefficient of expansion, °C. | 9.98×10^{-5} |
| Specific heat, cal./°C./g. | 0.006 |
| Mold shrinkage, in./in. | 0.006 |
| Demolding temperature, °F. | 212 to 220 |

| Outdoor Burial, 9 mo. | | |
|-----------------------|-----------------|---------------|
| | Tensile, p.s.i. | Elongation, % |
| Initial | 4480 | 170 |
| Indiana clay | 4570 | 140 |
| Indiana loam | 4260 | 140 |
| Florida inland | 4680 | 120 |
| Florida beach | 4770 | 150 |
| Florida sea water | 4730 | 100* |

* Damaged by sharp barnacles

| Chemical Resistance, 9 mo. | | |
|----------------------------|-----------------|---------------|
| | Tensile, p.s.i. | Elongation, % |
| Initial | 4480 | 170 |
| Shelf | 4800 | 130 |
| Tap water | 4300 | 170 |
| Salt, 10% | 4500 | 150 |
| Sulfuric acid, 10% | 4260 | 150 |
| Nitric acid, 10% | 4310 | 150 |
| Caustic soda, 10% | 4530 | 150 |
| Ammonia, 10% | 3930* | 160 |
| Sinclair 10 W | 4680 | 150 |
| W. Kansas sour crude | 4540 | 150 |

* No loss after 3 months



Courtesy Skyline Industries



Molded Cicolac lawn sprinkler head (complete unit at right) consists of four intricate sections

Cicolac pop-up type spray heads for do-it-yourself lawn sprinkler system withstand burial in soil

against breaking, chipping, or cracking under normal use. Following RCA, a number of other companies have been investigating the material and several are bringing out new models with molded Cicolac cases.

Santay Corp., Chicago, Ill., which molds three of the RCA "Impac" cases, uses injection machines of from 16- to 48-oz. capacity in producing the various components. In general, this molder has found that large gates and relatively high molding pressures produce the most satisfactory results. On one model, the front portion is center gated, while on the rear half of the cabinet a different gate arrangement was necessary due to the heavier wall section involved. On another model, the front and back are produced simultaneously in a two-cavity family

mold running in a 32-oz. H-P-M injection machine. The two halves of the case are triple gated, one at the bottom edge and the other at the top. Runners of heavy cross-section are used to facilitate rapid and complete filling out of the mold.

Unusual Cabinet Design

General Die Mold Co., Chicago, Ill., produces the Cicolac case for the RCA three-way set designed for a.-c., d.-c., or battery operation. G. Felsenthal & Sons, Chicago, Ill., which molds the case of the RCA portable in which the top tilts back to reveal a unique tuning scale, molds the front section in a single-cavity die on a 24-oz. Reed-Prentice machine, using center gating. The rear half of the case, produced on a 14-oz. Impeco vertical machine, uses

small gates located on the back of the part. The lift-up lid portion is molded in a two-cavity die on an 8-oz. machine. The unique handle of this set, which appears to be wound with black raffia, is actually molded in three separate parts, with the finger-grip style center section having extensions which are cemented into cores in the end portions to form the finished handle. Pressed-in metal bushings in the handle ends provide secure attachment to the top of the cabinet.

Golf Club Heads

Nadco Sporting Goods Co., Chicago, Ill., has specified Cicolac for the heads of a new line of top-quality golf clubs known as Nadco Diatomic. These heads are produced by injection molding, using a two-shot technique by means of which the white face plate is made an integral portion of the club head. The new plastic heads are said to overcome many of the problems associated with even the finest wooden club heads. In addition to their high impact properties, the Cicolac heads, unlike wooden club heads, will not absorb moisture and therefore will not change in weight or dimensions.

The molded plastic golf club heads have the further advantage of being exactly uniform from club to club. Wooden clubs, no matter how carefully manufactured, are bound to vary because of variations in the wood itself and in the production process. Produced by a core pin, the shaft hole of the plastic club heads

(To page 225)



Courtesy Sloane Mfg. Co.

Cicolac, along with other types of plastics materials, is used in producing line of molded pipe fittings for application in oil fields and general irrigation work

STOKES*plastics review*

VOL. 4

NO. 3

1955

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Stackpole Carbon Uses Plastics to Replace Metals in Electronic Components

Stokes automatic molding presses cut parts costs of variable resistors used in radio and TV

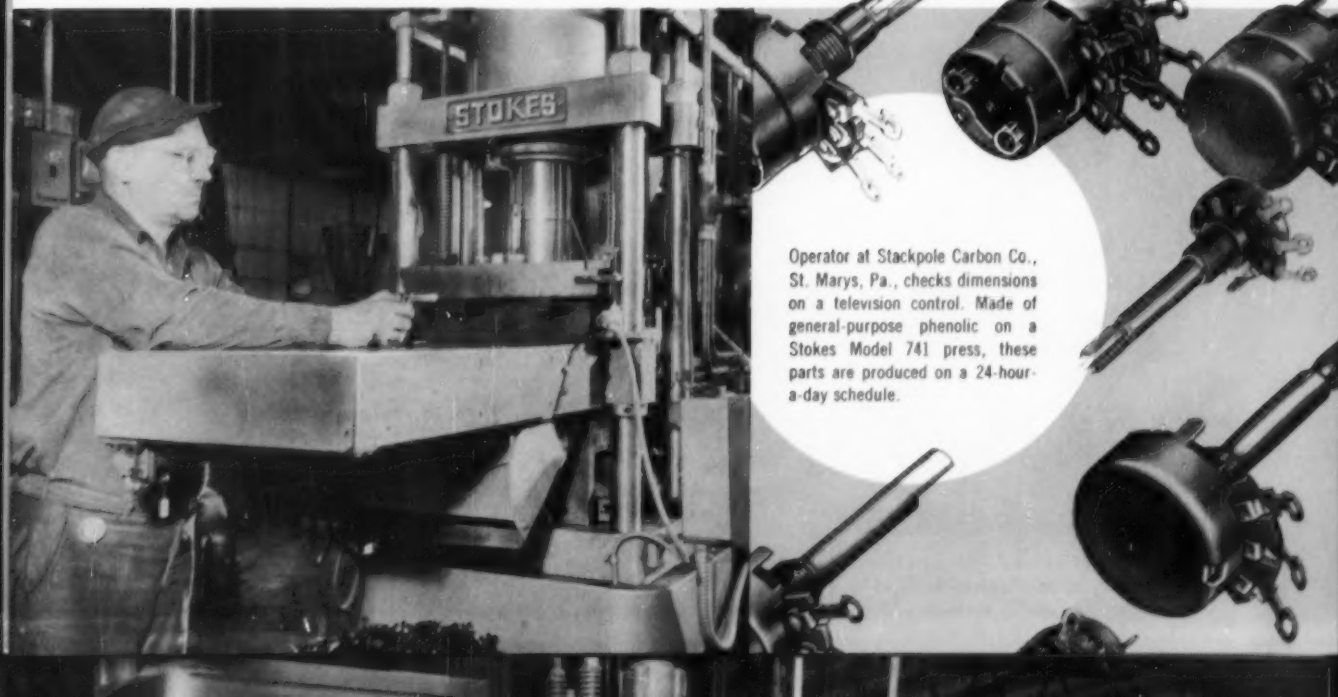
What in the modern world should we do without variable resistors? We'd not be able to hear radio nor see television; indeed, there wouldn't even be radio or television programs. And many of our other electrical and electronic devices would be non-existent.

One of the country's leading manufacturers of these little gadgets is the Stackpole Carbon Company of St. Marys, Pennsylvania. Here in a factory devoted to the manufacture of modern electrical and electronic components are made a great number of switches, coil forms, fixed and variable resistors, capacitors, powdered iron and "Ceramag" ferro-magnetic cores and similar devices.

Recent additions to the molding press department

are two Model 741 Stokes fully automatic compression molding presses of 50 tons' capacity. These mold parts for Stackpole variable resistors used in volume controls, tone controls, and potentiometers for radio and TV sets. Many parts previously made of brass, aluminum and other metals are now made of plastics at substantially reduced costs. The growing size of the Stackpole business indicates that quality of the plastic parts is fully equal, or superior, to that of earlier products.

N. J. Schaberl, Stackpole's production manager, reports that the firm is well pleased with the performance of the new automatic presses. Stackpole also uses Stokes compacting presses and equipment for vacuum impregnation of carbon parts.



Operator at Stackpole Carbon Co., St. Marys, Pa., checks dimensions on a television control. Made of general-purpose phenolic on a Stokes Model 741 press, these parts are produced on a 24-hour-a-day schedule.

The Engineer's Corner

Rope-feeding Attachment for Plastics Presses Permits Automatic Molding of Thermosetting Polyester Resins

Another Stokes engineering triumph is the new rope-feeder for use in the fully automatic molding of thermosetting polyester resins. These resins, reinforced with glass fibers, are currently being supplied in extruded rope form. The new rope-feeder is designed for attachment to the Stokes Model 741 fully automatic press.

This feeding mechanism is an immense advance over any previous device for similar purposes. It feeds the maximum number of cavities, within the capacity of the press, however arranged from front to back or left to right. The feeder is adapted to different molds by two simple adjustments.

In operation, each tube feeds a single cavity. As the feeder indexes, two jaws with needle-sharp teeth seize the plastic rope and draw it forward the prescribed distance. A guillotine blade slices off a piece of the required length. This drops through a hopper to the opening in the feed plate; thence through the tube into



the appropriate cavity. The Stokes rope-feeder can be adjusted to handle various lengths and diameters of rope.

Though polyester resins are somewhat more expensive than phenolics they offer numerous advantages. For one thing, they can be molded with less pressure. In rope form they are exceptionally easy to handle by any method of compression molding. The glass fiber reinforcement greatly increases impact strength so that the material can be used to advantage in place of mineral-filled phenolic for electrical components, fishing reels, and other parts where high shock resistance is desired. Contact your nearest Stokes district office for complete information on this development.

Christmas Comes Early in Florida

Leco Electric Uses Only One Stokes Automatic Press To Make All Sockets for Holiday Light Strings

Though Leco Electric Manufacturing Co. makes lighting sets the year around, mid-summer touches off a big burst of activity in their plant at Florida, N. Y. One reason for this activity is known; another may be guessed. First, you can't start too soon to get ready for the well-known Christmas rush. Second, if the boys and

girls get well ahead with their work there may be time to see the trotters run at the famous harness-racing track at nearby Goshen. Night and day Leco keeps its one Stokes Model 800 press turning out light sockets of many sizes in general-purpose phenolic and tinted urea. Since it is fully automatic, the press requires little attention other than material supply and removal of finished parts. The firm's operations are a good example of how a molding department consisting of only one automatic press can be operated profitably. Jerry Neustadt of Leco says, "Our longest uninterrupted run was 24 days, during which the machine was stopped only for oiling and greasing." Typical production during a 24-hour day is 16,000 candelabra sockets from a 9-cavity mold.

The Leco business was started in the Bronx, but four years ago was moved to its present location. Production continues at the pace of a Dodgers' winning streak but the surroundings are quieter.

Complete information on the cost savings available to plastic molders through the use of fully automatic Stokes presses is contained in a new brochure, "Fully Automatic Compression and Injection Plastics Molding". Send for this brochure and Bulletin No. 513 describing the Stokes Model 800 Automatic Compression Molding Press.



Stokes Model 800 automatic compression molding press at Leco Electric Manufacturing Co., Florida, N. Y. The large hopper provides for 'round-the-clock operation necessary during the pre-holiday rush season.



Stokes Model 727 straight ram semi-automatic molding press in plant of Hellmich Manufacturing Corp. at Bayamon, Puerto Rico. This is one of many Stokes presses used in the manufacture of "Color-Flyte" melamine tableware. At right is power unit with the patented Stokes Bar Controller which actuates the press during the automatic phase of operation.

Plastics Plays Important Part in Puerto Rico's "Operation Bootstrap"

Stokes Toggle and Straight Ram Presses used exclusively in Molding of Melamine Tableware

A growing firm in the industrial upsurge of Puerto Rico is Hellmich Manufacturing Corporation at Bayamon. This plastics plant manufactures "Color-Flyte" dinnerware consisting of cups, saucers, bowls, plates, tumblers and other serving pieces.

The attractive feature of this melamine ware, aside from the four colors in which it is available, is the complete freedom from breakage. It can be washed by hand or machine, dropped on the floor, scaled at a dog digging in your favorite rose-bed or otherwise abused without impairment of its beauty or soundness.

Stokes presses are used exclusively to mold all Color-Flyte products. Differing requirements in the production of Color-Flyte dinnerware led to the selection of two types of Stokes molding equipment: Model 731 Toggle presses for economy in the production of shallow fill parts, and Model 727 straight ram presses for versatile operation on many other pieces.

Edward J. Hellmich, President of the Puerto Rican company, says of the Model 731, "These presses have been operating since their installation in September, 1953 without maintenance. Mold changes are very easy to make. We have just placed an order for two more 150-ton Model 731 Stokes Toggle presses." A typical Stokes Model 727 straight ram press in the Hellmich plant is shown in an adjacent picture.

Send for Bulletin 520, describing Stokes straight ram presses, and Bulletin 516, on the Model 731 Toggle Press.



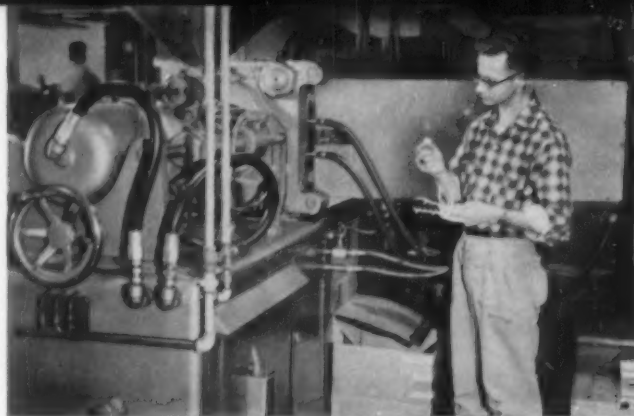
10,000,000 'Viewmasters' Sold and Sawyer's is Still Improving Production Methods

Addition of Stokes truly automatic injection molding machine gives low labor costs, trouble-free service

Sawyer's Inc. of Portland, Oregon, once a small post-card business, is now one of the largest manufacturers in the Northwest. The key to their marketing success has been the fabulously successful Viewmaster, modern version of the old-fashioned stereoscope. Ever since its introduction, Viewmaster bodies have been produced on Stokes automatic compression molding presses.

Sawyer's has 12 of these presses installed. At about the same time that it produced its 10-millionth Viewmaster, Sawyer's purchased a Stokes Model 700 truly automatic injection molding machine. The installation of this Stokes machine was another step in the firm's continuing search for more economical production. Tangible results of this firm's manufacturing program have been a stable price for Sawyer's products despite a general increase in prices of most goods.

The economics of the Stokes Model 700 have been applied to the production of advance levers and buttons for the all-plastic Viewmaster. These parts, previously made of metal, are produced from general-purpose and high-impact styrenes.



Advance levers and buttons for the Viewmaster, popular Sawyer's product, are made on this Stokes Model 700 truly automatic injection molding machine. Stokes automatic compression molding presses produce the bodies for this all-plastic viewer.

The machine is so quiet in operation that it has been installed in the assembly department where its output is used, thus simplifying materials handling. Started in the morning by an operator, the Stokes Model 700 runs automatically requiring only infrequent inspection and powder supply. The parts are automatically degated and require no finishing operation.

Details of how the Stokes truly automatic injection molding machine can lend increased economy to your operations are contained in Bulletin 560 and a new brochure on "Fully Automatic Plastics Molding", both of which will be sent on request.

Growing Use of Plastics Foreseen In Automotive Industry

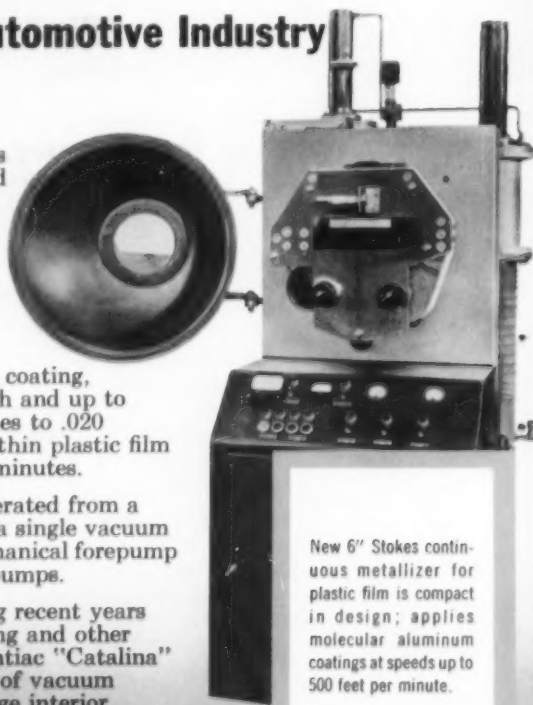
New Stokes Continuous Metallizer gives faster, lower cost production of decorative film for interiors

The latest development in Stokes vacuum metallizing equipment is a line of units for the continuous roll metallizing of plastic film and sheeting. Though smaller in size and comparatively lower in cost, the new Stokes units coat plastic film faster than any equipment previously available. The old dual-chamber arrangement—one for out-gassing the plastic and the other for application of the evaporated metal—has been replaced by a single chamber. The Stokes unit cuts cycle time since the film is out-gassed and coated in one pass through the chamber.

This compact "package" unit applies a uniformly brilliant metallic coating, 3- to 5-millionths of an inch thick, to rolls of 6 to 60 inches in width and up to 24 inches in diameter. It will handle film thickness from .0002 inches to .020 inches at speeds up to 500 feet per minute. Thus, a 24-inch roll of thin plastic film containing as much as 40,000 feet of material can be coated in 80 minutes.

The new Stokes continuous metallizing units are automatically operated from a push-button control panel. Because of single-chamber design only a single vacuum pumping system is required. This consists of a Stokes Microvac mechanical forepump and the new, high-speed Stokes "Ring-Jet" diffusion and booster pumps.

The vacuum metallizing process has come into extensive use during recent years for coating of tail-lights, scuff plates, dashboards, upholstery welting and other automobile parts. The panels beneath the windows of the 1955 Pontiac "Catalina" and Buick "Century" are a striking example of the decorative use of vacuum metallizing. Metallized plastic film is also being used to trim luggage interior.



New 6" Stokes continuous metallizer for plastic film is compact in design; applies molecular aluminum coatings at speeds up to 500 feet per minute.

STOKES

F. J. STOKES MACHINE COMPANY

5534 TABOR ROAD, PHILADELPHIA 20, PA.



Courtesy British Plastics

Over-all view of main floor of British Plastics Exhibition, showing machinery displays (foreground) and material makers' exhibits (upper left)

BRITISH PLASTICS EXHIBITION

IN TOTAL attendance, as well as in the number of exhibitors taking floor display space, the third British Plastics Exhibition, sponsored by *British Plastics* and the British Plastics Federation, set a record high. Despite the inconvenience of a general railway strike, over 35,000 people—as compared with a total of 28,000 in 1953—attended the exhibition at the Grand Hall, Olympia, London. On view were the displays of 120 companies (94 was the previous record for the number of exhibitors) occupying about 55,000 sq. ft. of floor space.

Material Suppliers

Virtually every branch of the plastics industry, including molders and fabricators, raw material suppliers, and machinery manufacturers, was represented at the show.

The booths of the raw materials suppliers (30 companies in all) were

situated on the first floor of the Grand Hall and were devoted primarily to displaying the wide range of materials available to the British plastics industry and the many end-products that could be made from these materials.

In reviewing this section of the exhibition, several strong trends in materials usage were noted. An increasing use of styrene, with emphasis on improved high-impact-type grades, for example, was particularly evident. Industrial end-products, including many refrigerator components, were most prominent among the items molded of high-impact styrene on display, but it was considered significant that quite a few toys and household accessories also appeared in this grouping.

Special attention was also focused on products vacuum formed of styrene sheeting. In this category, a

formed liner for refrigerator doors drew considerable comment. The consensus of the visitors who viewed the liner was that developments in vacuum forming coupled with the introduction of high-impact styrene sheeting in England would do much to expand the volume of plastics materials going into the British refrigerator market.

Extrusions

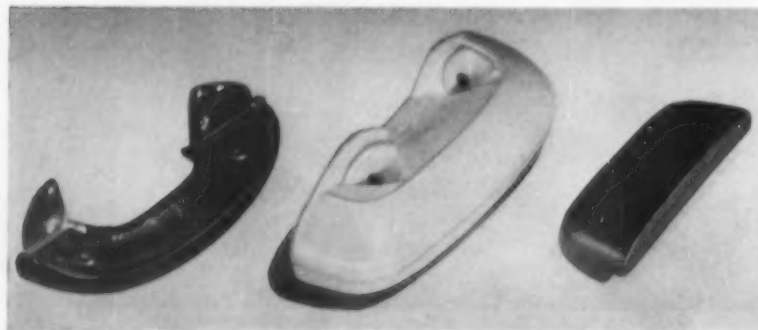
Another outstanding feature of the products on display was the variety of extrusions, both rigid and flexible, being shown. Rigid vinyl tubing, in particular, was given a prominent position in product displays. At least six exhibiting companies showed tubing of this type in a wide range of diameters for different purposes.

Vinyl sheeting and vinyl-coated fabrics also were prominent. Rigid
(To page 221)

FLEXIBLE FOAMS — Present and Future

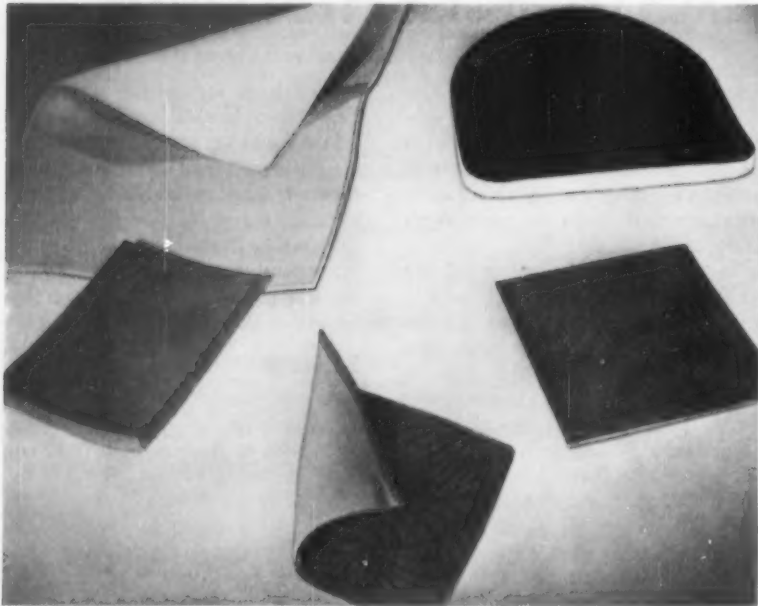
A comparison of manufacturing methods, physical properties, uses, consumption, and production costs for three foams

by J. A. CARR* and B. B. WILLIAMS†



Courtesy Elastomer Chemical Corp.

Though differing in design and appearance, these three automobile arm rests all consist of foamed vinyl cores with slush molded skins, molded around insert metal supports



Courtesy Mobay Chemical Co.

Polyurethane foam combined with other materials makes possible many end-use applications: Top left, towel material glued to urethane foam makes bath mat; top right, fabric flocking has been added to urethane foam, using isocyanate cement; bottom row, left to right; leather, carpeting material, and quilted vinyl film adhered to urethane foam

THE flexible foam picture is changing so rapidly that by the time this article appears in print, certain statements made here may well be out of date. We will discuss here only foamed rubber latex, vinyl foam, and urethane foam, since they are either now produced in considerable volume, or promise to be so.

Foamed latex production in the United States has increased from 18 million lb. in 1947 to over 160 million lb. in 1953. It has been predicted that by 1960, production of all flexible foams can reach 400 million pounds. The question being resolved now concerns the extent to which this poundage will be split among these three materials. In this article, these three foams will be compared as to methods of manufacture, physical properties, and uses and consumption; an indication of comparable production costs will also be given.

How Foamed Latex is Made

To make foamed latex, compounded latex is either foamed mechanically by whip and bowl or, more commonly, by an Oakes Frother, or it can be foamed chemically by the use of hydrogen peroxide, plus an activating substance whereby oxygen is released. The Dunlop process, which involves mechanical frothing, uses a gelling agent such as sodium silicofluoride. The still liquid froth is poured into metal molds or on a moving belt. Within a few minutes this liquid foam gels into a solid foam and is then cured at 212° F. The product is washed and dried after cure.

In the Talalay method, wherein the latex is foamed chemically, the latex mix, plus foaming agent, is placed in a mold, which is then closed. The mix foams, and when foaming is complete the foam is frozen, and is then gelled by carbon dioxide gas. The gelled foam is then cured, washed, and dried.

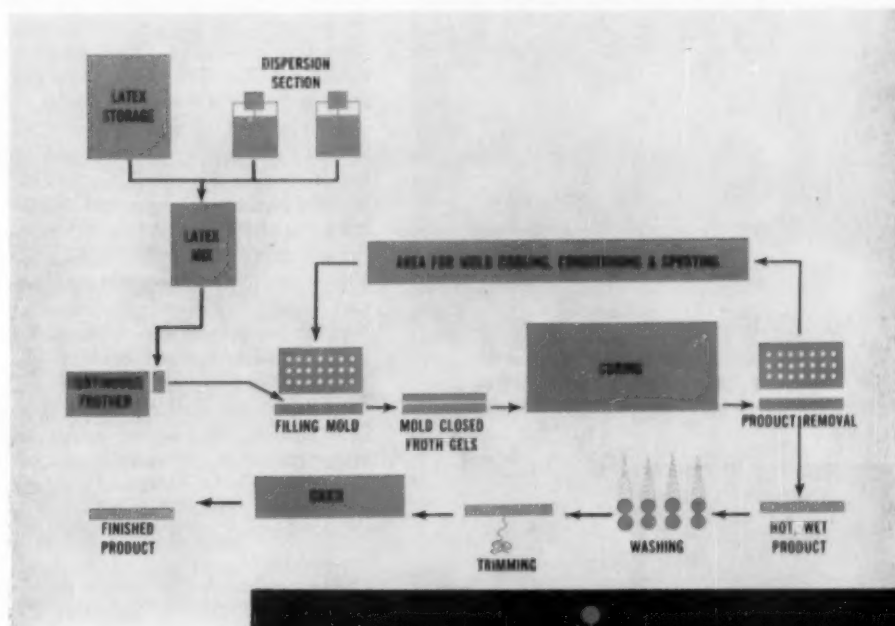
Ways to Make Foamed Vinyls

Cellular vinyl material is formed either by sponging the mass with a blowing agent such as Unicel ND, Cellogen, BL353, or by foaming a vinyl plastisol. In the blowing process, care must be taken that in the

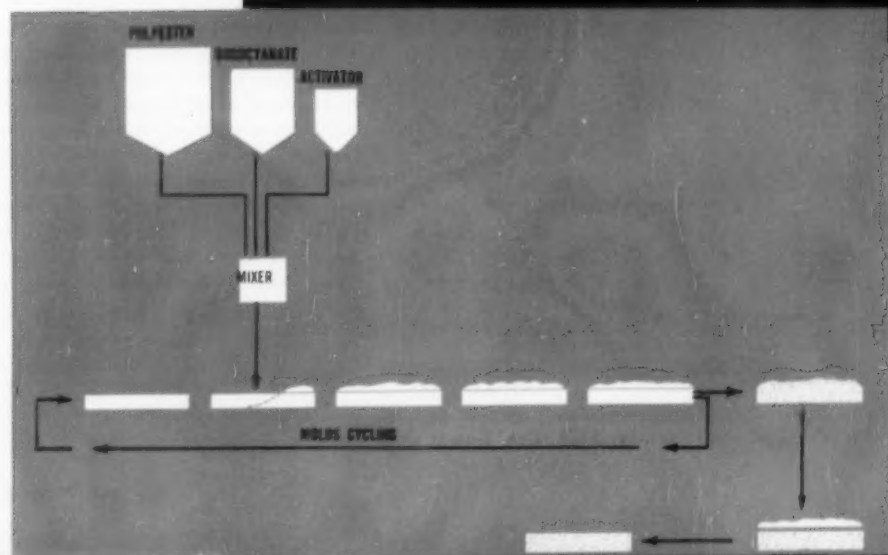
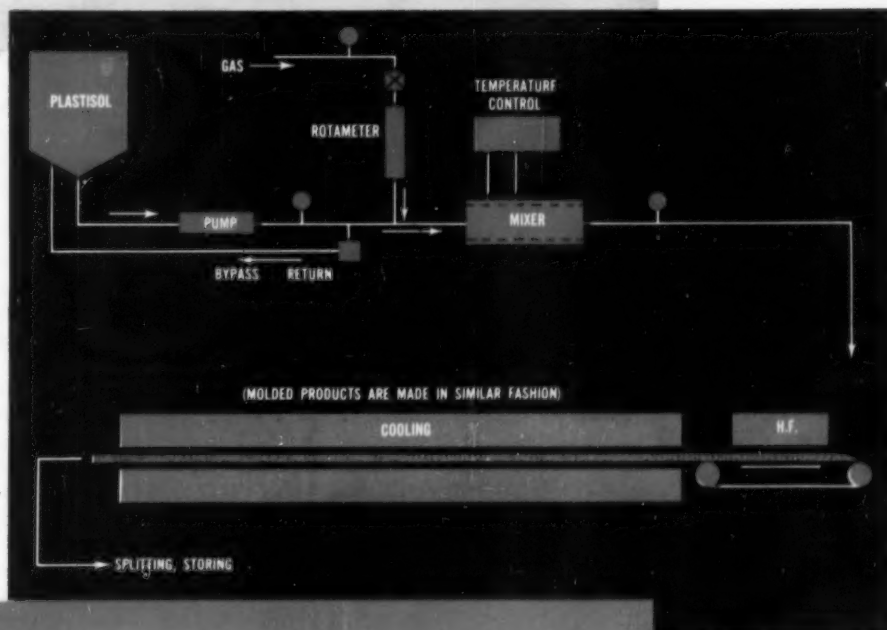
* Dunlop Research Centre, Toronto; † Dunlop Canada Ltd., Pillofoam Div.

This article was specially prepared for MODERN PLASTICS Magazine by the authors, who also presented a paper on the same general subject before the S.P.I. (Canada) Inc. 1955 Annual Conference

Flow Charts of Steps in Production of Three Flexible Foams



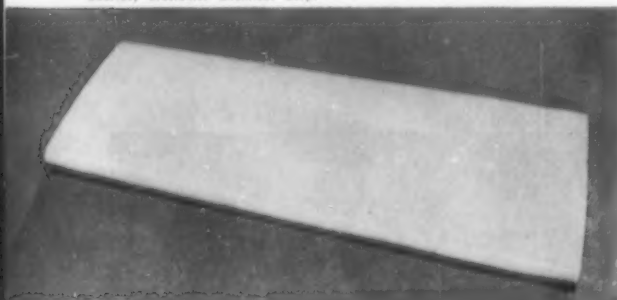
VINYL FOAM PRODUCTION



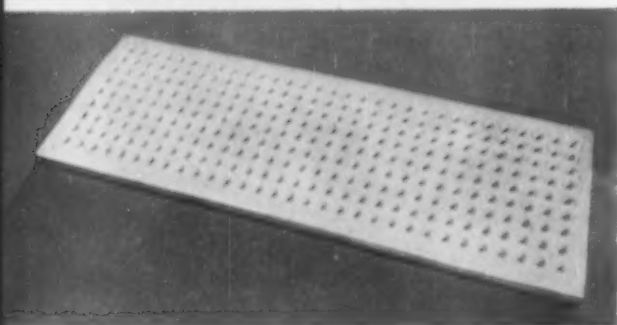


Courtesy Elastomer Chemical Corp.
Ladies' handbags are produced using heat sealed foamed vinyl to create embossed, decorative effect. Bags were manufactured by Rubatex Div., Great American Industries

Courtesy Elastomer Chemical Corp.



Cored and contoured
foamed vinyl cushions
were molded for use as
seat upholstery in New
York City subway cars



Courtesy Elastomer Chemical Corp.



Automobile crash pad (top and bottom view) is produced by foaming vinyl compound around metal support. Skin is formed during cure

choice of blowing temperature the plastisol is not gelled prior to the formation of all the gas, nor should the viscosity of the plastisol be such that a significant portion of the gas escapes before gelation occurs (1)¹.

One method of foaming a vinyl plastisol is the process developed by the Elastomer Chemical Corp. (2). In this process the plastisol is allowed to absorb carbon dioxide under a pressure of more than 100 p.s.i. and at a controlled temperature. This gas-bearing plastisol is then passed through a spray nozzle from which the plastisol sprays as a snowy foam. The foaming plastisol can be sprayed on to a moving belt to form a slab or it can be sprayed into molds. In either case, it is preferable to gel and fuse the foam by means of a high-frequency heating unit. This takes much less time than to gel and cure foamed latex.

A somewhat similar process developed by the Dennis Chemical Co. allows the plastisol to absorb gas in an absorption tower at a pressure less than 100 p.s.i. When the gas-bearing plastisol is released from the foamer it expands and may be molded.

Urethane Foam Production

Urethane foam has also been called polyurethane foam, isocyanate foam, and polyester foam. In its production, a polyester and a diisocyanate plus certain water-bearing activating and processing materials are intimately mixed. The diisocyanate reacts with the reactive hydrogen in the polyester, and in the water to chain extend and cross-link the polyester, and to form carbon dioxide.

These reactions take place in a matter of minutes, particularly the reaction during which carbon dioxide is formed. As the molecules link up and form a network, viscosity increases, the gas is retained in bubble form, and in a few minutes the foam is turned to a solid foam. The reaction is exothermic, so that curing is not required. Since the last portion of the setting and hardening period normally takes several weeks to complete at room temperature, a

¹ Numbers in parenthesis link to references at end of this article, p. 236.

THE AUTHORS

Jack A. Carr—After graduating from the University of Toronto in Chemical Engineering, Mr. Carr spent four years in the R.C.A.F. on development work. Joining Dunlop Canada in 1945, he became head of the Foamed Latex Process Control and Development Dept. In 1953, he was transferred as assistant manager to the newly organized North American extension of the Dunlop Research Centre.

Bruce B. Williams—After wartime army service, Mr. Williams studied Chemical Engineering at the University of Toronto and graduated in 1949. Following two years' service with Canadian General Electric, he joined Dunlop Canada in 1951 to take over the Foamed Latex Development Section. In 1953, he became head of the Process Control and Development Dept. of this division. Currently, he is also looking after the production of Dunlop Canada's new plant at Whitby in connection with foamed latex.

mild heat treatment can be used to reduce this time and to further cure the exterior of the block, which is not subjected to as high a temperature from the reaction as is the center of the block.

Since density depends upon only slightly different recipes, a high degree of chemical mixing control is required. The diisocyanate is semi-toxic and precautions must be taken.

Comparison of the Processes

In foamed latex, the amount of scrap is relatively high, and because of the rapid speed of gelation and because the material is thermosetting, the scrap, either gelled or cured, cannot be re-used in the process. At present, the amount of waste in the manufacture of polyurethane is very high, even after several years of experience in Germany. Again, this scrap foam cannot be re-used in the process. In vinyl foam, gelation does not occur at room temperature and foamed plastisol scrap can be returned to the process. Fused foam can be re-ground and used in extrusion.

Foamed latex is very easy to mold. It is, so far, difficult to mold polyurethane foam except in simple, i.e., uncured, shapes in open molds. In this case, a large portion of the top has to be removed and scrapped. This problem is under energetic attack. Vinyl foam can be easily molded and

recently a process has been developed to rapidly cure moldings by high-frequency heating. The molded skin is tough but not as porous as desired.

In the processing of the three materials, polyurethane foam is the only one requiring little or no heat for cures, since the reaction is exothermic.

In the cases of vinyl foam and polyurethane foam, there need be no washing and drying as is the case with foamed latex.

Because of the speed of gelation of both foamed latex and polyurethane foam, large-capacity equipment is required to fill large molds for gelling.

Formulation is rather inflexible for foamed latex and density increases are required for an increase in hardness. Both vinyl foam and polyurethane foam technology offer greater ranges of formulation.

Foamed latex can be cemented together, but sewing and heat-sealing are difficult. Latex cannot be foamed in place. Vinyl foam slab can be directly adhered to fabrics and vinyl films, but also cannot be foamed in place. Polyurethane foam can be foamed in place and the adhesion on foaming is good. Polyurethane foam sheet can be sewn and heat sealed.

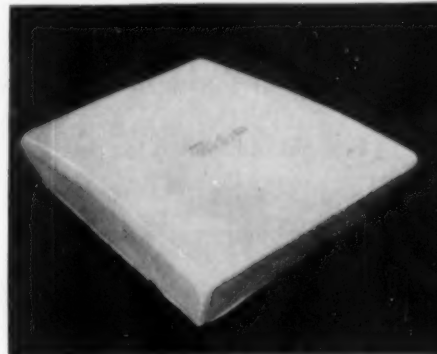
Properties of Foamed Materials

Since the foamed materials are used unit- or volume-wise, but since the raw materials for the foams are
(To page 231)



Courtesy Dunlop Canada Ltd., Fillofoam Div.

Urethane foam is finding use in the manufacture of such articles as slippers



Courtesy American Collo Corp.

Foamed latex theater seat is washed and dried after it has been fully cured



Courtesy Mobay Chemical Co.

In Europe, urethane flexible foam finds application as "topper pads" for use over springs in car seats and backs. Foam provides good cushion support and ventilation

Putting the Bite on Styrene



Close-up of injection molded styrene denture, showing excellent molding detail and smooth finish of the plate

New method of producing dentures involves extruded styrene bars

brought to molding temperature in electrically heated oven

IN PERFECTING modern techniques in the field of restorative dentistry, various types of plastics have played leading roles for many years. Cellulose nitrate and phenolic were among the first plastics materials to be used in the manufacture of dentures; more recently, specialized formulations of acrylic have moved into prominence.

Now, a specially modified styrene, produced under the tradename of Jectron and supplied by Jectron Co., Toledo, Ohio, has become the latest plastic material to find acceptance by the dental profession. In the form of extruded translucent pink bars, approximately 6 in. long and $\frac{3}{4}$ in. in diameter, the styrene material is used in conjunction with a specially designed small "injection machine" (in which a mechanically operated ram assembly drives the softened plastic into a closed mold) to facilitate the accurate production of long-wearing, comfortable dental plates.

Many Advantages

The development of the styrene material and the Jectron technique for molding it into dental plates is

the result of research dating back to 1940. To date, more than 100,000 dentures based on the system have been produced—and numerous clinical reports have confirmed their desirability.

Three of the major advantages claimed for molded Jectron dentures are an exceptionally high degree of accuracy in processing, excellent hardness and density, and excellent dimensional stability while in use.

In addition, according to the supplier, dentures prepared from this specialized styrene have longer flexure fatigue life, greater transverse strength, and higher heat resistance and insolubility than dentures based on most other materials. It is also non-toxic in both solid and dust form and, even when exposed to ultra-violet light, its color should last indefinitely.

The volumetric processing shrinkage of Jectron is only $\frac{3}{4}$ of 1%, as compared to 6 or 7% reported for some other types of plastics materials used in dentures. Jectron styrene does not expand in the mold and, therefore, has only about one-eighth the molding shrinkage found in competitive denture materials—

an important advantage in precision-fitting the plate to the jaw for comfortable wear.

Long-Wearing Service

The molded Jectron plate has a Rockwell M hardness of 88, compared with an average of about 100 for the dental acrylics, which are the hardest, and of from 70 to 78 for vinyl-acrylics.

The smooth texture of molded Jectron is also an outstanding feature of the material. In earlier development work, it had been discovered that resistance to abrasion depended not only on the hardness of a plastic material, but to a large extent, on its texture. The smoother the denture, the less resistance it offers to scuffing action.

According to the manufacturer, Jectron is also the only denture material with a transverse strength consistently above 14,000 p.s.i. The test for transverse strength shows how much biting pressure is required to break or permanently distort a denture. It is further stated that only Jectron has a flexure fatigue life consistently beyond 4 million flexures, under a 2500 p.s.i.



Two-part denture mold prior to assembly. Teeth, embedded in upper half of mold, will be integrated into the casting during the injection operation



Extruded bar of styrene, in injection tube, is inserted into electric melting even where it will be softened

load, without breaking or becoming distorted. The exceptional strength of a Jectron denture is attributed largely to the laminated construction created as the material flows into the mold in a series of layers.

Other properties of Jectron styrene material include: thermal rigidity ranging from a minimum of 220 to 238° F. (thereby minimizing the danger of damage during cleansing operation in hot water or of distortion during repair or rebasing operations) and exceptional resistance to solubility (Jectron has a rating of virtually nil in the standard American Dental Association solubility test). Water swelling is also reported to be practically absent.

Injection Machine

The specially designed injection machine used in producing Jectron dentures obtains its power from a high-speed electric motor operating through reduction gears. Standing
(To Page 238)

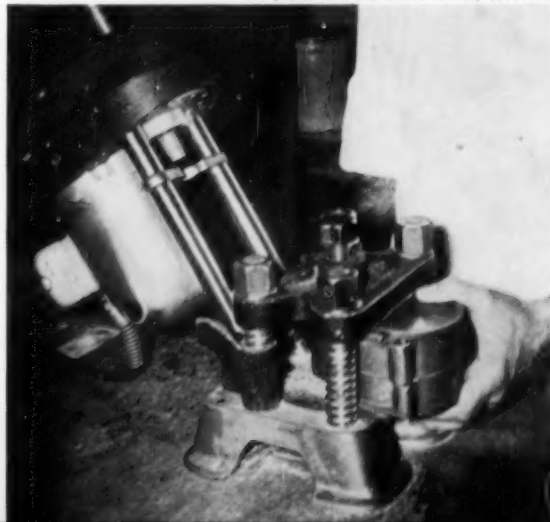


Mold, with wax "boiled out," is being closed preparatory to placing it in molding press. Head of press is hinge-mounted to facilitate insertion and removal of mold

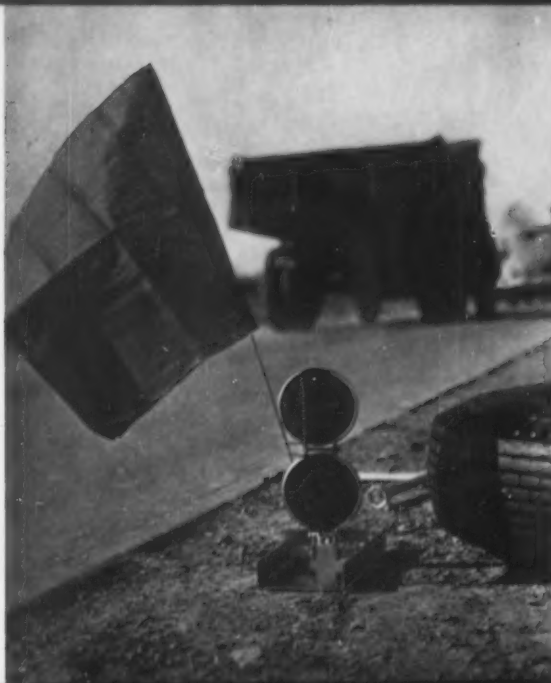
With closed mold locked securely in place in machine and injection tube in position, operator starts cycle

Mold is removed from machine at end of cycle. It will next be separated and investment material broken away to release the denture

All photos with this article courtesy Jectron Co.



PLASTICS



Compact Emergency Marker

A highway safety device of the type usually used by truck drivers has been redesigned to fit the requirements of passenger car use. Called Vari-Flare, the unit consists of two bright red acrylic reflectors mounted vertically in a metal frame. During daylight, a red flag held in a bracket attached to the frame serves as an added safety feature; at night, the manufacturer claims, the reflectors can be seen more than half a mile away. The device is designed so that it can be conveniently stored in a glove compartment when not in use.

Vari-Flares can be easily set up. In the closed position, the hinged reflectors lie flat against the frame; when ready to use, the reflectors are lifted up until they lock in position. The wide base of the frame also serves as a stabilizer to prevent the unit from overturning in high winds. The reflectors are injection molded in a two-cavity mold.

CREDITS: Molded by Stimsonite Corp., Chicago, Ill. for Vari-Products Co., Inc., 2450 S. Prairie, Chicago, Ill. Acrylic by E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.



Roll-Top Bread Box

Three loaves of bread or an equal amount of pastries or other bakery products can be stored in a spacious (13 $\frac{3}{4}$ in. wide, 12 in. deep, and 6 $\frac{1}{4}$ in. high) bread box which consists of a colorful body molded of styrene and a smooth-sliding roll-top door molded of polyethylene. The door slides along tracks molded into both sides of the box for easy opening and closing. In closed position, the flexible door can be pulled out to overlap the bottom edge of the box for a tight seal. The door can be removed, when necessary, for a thorough cleaning and can then be snapped back into place; in daily use, wiping with a damp cloth is sufficient to clean the door of ordinary dirt marks.

Three molds are used to produce the bread box. The end pieces and the door are both run in two-cavity molds in a 24-oz. injection machine; the main part of the box is run in a single-cavity mold in a 32-oz. machine. To facilitate assembly, a special holding jig was designed for positioning the door.

CREDITS: Manufactured by Beacon Plastics Corp., 82 Needham St., Newton Highlands, Mass. Polyethylene supplied by Bakelite Co., New York, N. Y.



PRODUCTS

Formed Sheet Bird Houses

Bird houses formed from styrene copolymer sheet with a sand-blast grain finish not only provide snug nesting places for birds, but also serve decoratively in garden landscaping. The houses, formed in two symmetrical halves, are available in five ultra-modernistic sizes and shapes designed to conform closely to the basic nesting needs of the birds that frequent any given neighborhood. The two halves are joined together with a neoprene band that snaps over the extended and mating rims formed around the top of each half. The two halves can thus easily be separated for cleaning. Waterproof, odorless, and verminproof, the bird houses also have provision for ventilation and drainage. Because they are so light in weight, simple but adequate mounting brackets can be used.

Since the houses require comparatively deep draws, the plug and ring process of pressure forming is used.

CREDITS: Manufactured by Howard Miller, Plastics Div., Zeeland, Mich. Royalite sheets supplied by Naugatuck Chemical, Div. U. S. Rubber Co., Naugatuck, Conn.

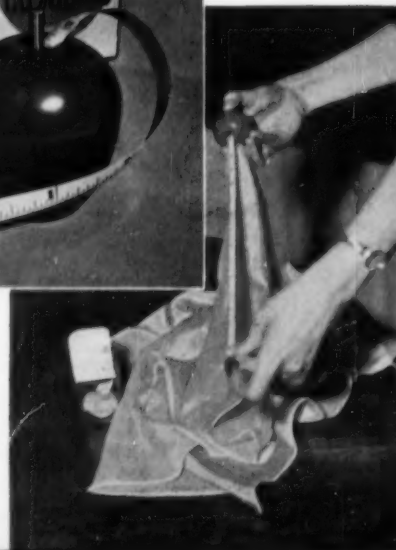


Novelty Tape Measure

A styrene-housed tape measure, called Red T'Apple, is a practical and attractive household sewing accessory. Realistically molded in the shape of an apple, the housing has a magnetized bottom which picks up steel pins and needles. The yard-long flexible metal tape can be locked at any desired length by simply rotating the stem of the apple. To release the tape, the stem is turned in the opposite direction. The apple housing stands 2 5/8 in. high—small enough to fit in the palm of the hand or to be conveniently stored in standard sewing boxes.

The housing is molded in two halves in an eight-cavity mold on an 8-oz. injection molding machine. The molding cycle is approximately 25 seconds. A molded shoulder inside the housing holds the spring which retracts the tape after it has been pulled out and released. The tape is attached to the spring and then wound over a cotter pin also mounted on the shoulder. The magnet is glued inside the bottom half of the body. The two halves are cemented together to complete the assembly.

CREDITS: Molded by Pyro Plastic Corp., Union, N. J. for United Device Corp., Great Neck, N. Y. Styrene supplied by Koppers Co., Inc., Pittsburgh, Pa.

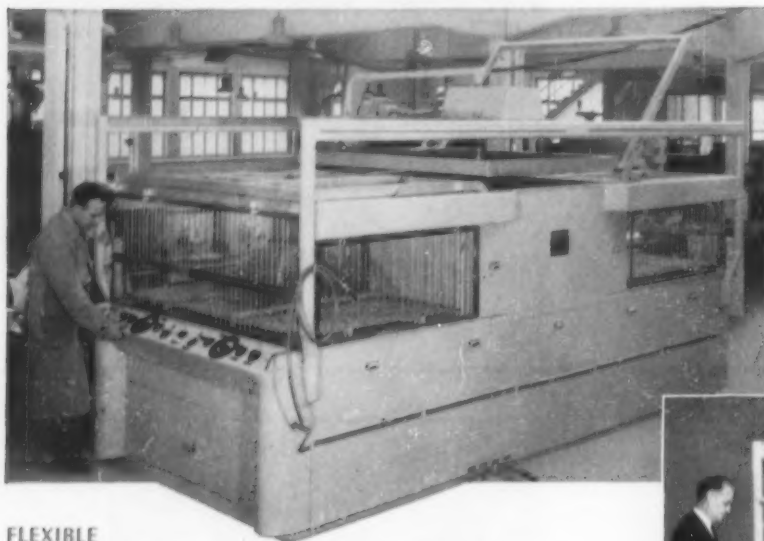


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| Single-Table | G5 | 40" x 60" | 22" | 20" |
| Single-Table | G6 | 48" x 72" | 22" | 20" |
| Twin-Table | 2G5 | 40" x 60" | 22" | 20" |
| Twin-Table | 2G6 | 48" x 72" | 22" | 20" |

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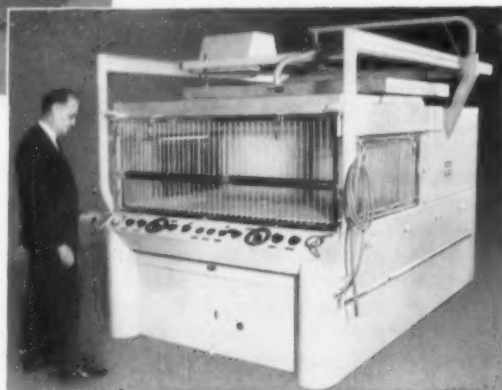
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See section 8—machining and equipment—for full information on Welding Engineers, Inc. Compounding and Extruding Equipment.

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Rotational Molding of Plastisols

Specific details that permit intelligent evaluation of the

process and that are necessary for efficient operation

by SAMUEL ZWEIG†

MORE widespread use of rotational molding of vinyl plastisols is foreseen as the result of the recent development and availability of various types of production equipment. Accompanying advances in plastisol formulating technology have contributed to a broadening of potential markets.

In brief, the following sequence of operations is generally employed in the rotational molding process:

1) A hollow, thin-walled sectional mold is charged with a measured amount of fluid plastisol and then closed.

2) The mold is rotated in a compound manner, such as about two axes, and, at the same time, is heated. The contained plastisol is forced against the interior surface of the mold by centrifugal force and, as the temperature of the material rises, it forms a gelled film on that surface.

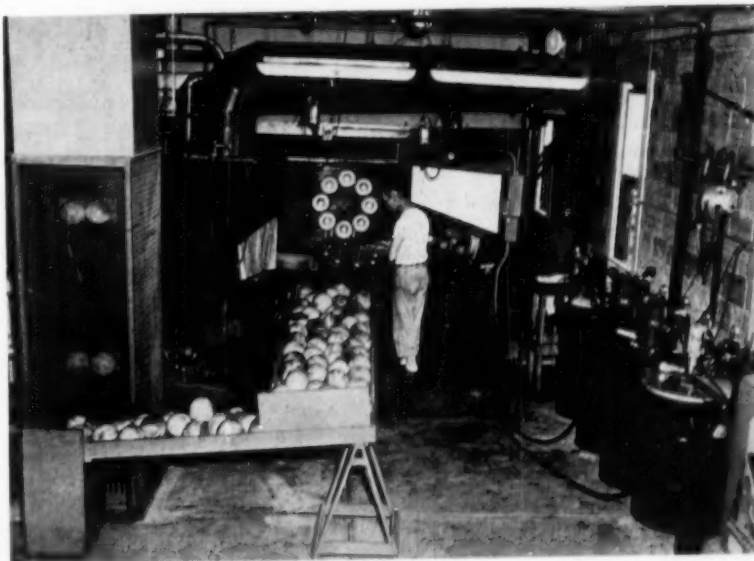
3) Heating of the mold is continued until the gelled plastisol reaches the fusion temperature, which is generally about 350° F. At this temperature the vinyl acquires maximum tensile strength.

4) After the mold is cooled and opened, the finished article is removed. Then the mold is dried, making it ready for the next cycle.

Advantages of rotational casting are obvious when the process is compared to other methods of forming plasticized vinyl:

1) Accurate control of product weight is assured because a precise quantity of material can be dispensed into each mold cavity.

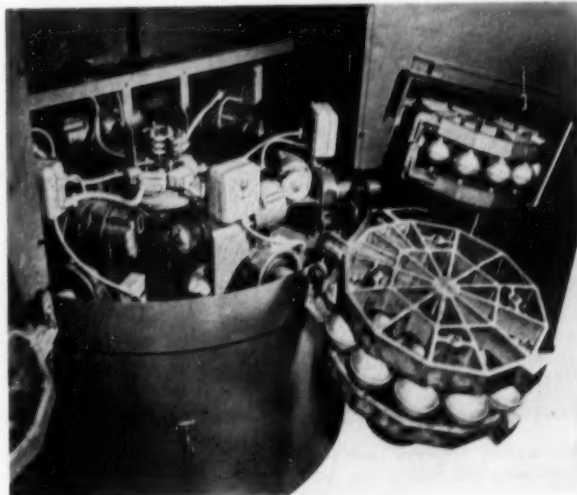
2) The operation requires less



Over-all view of production set-up for rotational molding of vinyl balls. Operator in background is filling eight-cavity mold with plastisol; molded balls roll off at left

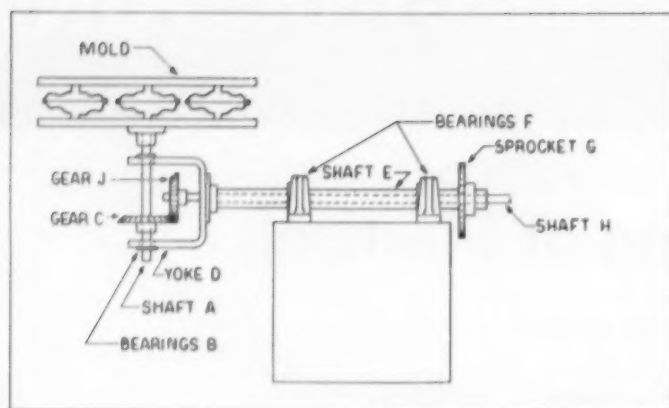
Photos courtesy The Akron Presform Mold Co.

Inside view of rotational molding machine, showing rotating mechanism. Electric motors, one for each set of molds, impart the degree of compound motion to the mold necessary for proper molding



* Reg. U. S. Pat. Off.

† Resluc Chemicals, Inc., Chicago, Ill. Text was prepared in collaboration with the technical staff of that company.



Schematic diagram of a typical design for a mechanism to produce compound motion required in rotational molding. Details of operation are described in text at right.

floor space than comparable slush casting installations.

3) The operation is generally cleaner, conducive to lower labor costs, and subject to closer control of variables.

4) Scrap and reject rates have been found to be much lower than those experienced in other processes, particularly where the rotational casting process has been applied and operated with ample understanding of its technology.

Naturally, the process is limited to hollow articles, either completely enclosed or with a portion subsequently cut away. Otherwise, very few limitations exist as to shape and complexity. Furthermore, there are some shapes which cannot be otherwise economically formed.

Rotational casting of vinyl articles offers further attractive features when compared to the molding techniques used with rubber. Assuming that a plastisol can be formulated to meet chemical and physical specifications, the immediate benefit is vast improvement in product appearance through high gloss and unlimited color availability. The capital requirements for equipment, molds, and related facilities are usually a small fraction of those necessitated for rubber molding operations.

Rotational Casting Equipment

A unique feature of the rotational casting process is the wide latitude available in the selection of basic equipment applicable to very small

or very large operations. Laboratory rotating machines, also suitable for pilot-scale production, are available commercially or can be constructed at nominal cost. Evaluation of products and molds can be carried on by means of such a pilot installation to aid in selection of production equipment.

The accompanying drawing illustrates a typical means of achieving the compound motion necessary to rotational molding. The mold or cluster of molds is secured to the end of shaft A, which revolves in bearings B and is driven by bevel gear C. The bearings B are mounted in yoke D, which in turn is fixed rigidly to a hollow shaft E. The hollow shaft E rotates in bearings F and is driven by a suitable sprocket or gear G, which is connected to a power source by meshing gears, chain, or belt. Bevel gear J is fixed to shaft H, which is contained within hollow shaft E and is held stationary by locking means at its opposite end.

The function of the mechanism can be visualized most easily by first considering the motion of the primary shaft E. As this hollow shaft is rotated, the entire assembly, except shaft H and its gear J, is swung in an arc about the axis of shaft E. As gear C swings about this vertical arc, the engagement of its teeth with those of stationary gear J causes the secondary shaft A to rotate in a plane perpendicular to the plane of rotation about the primary shaft E. Centrifugal forces brought



Twelve-cavity rotational mold produces 16-in. doll legs. Output capacity for this mold is 360 doll legs per hour



Twenty-seven-cavity doll shoe rotational mold mounted on rotational molding machine. Production capacity is 1620 shoes per hour

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● Information regarding Tenite also can be obtained from local representatives listed under "Plastics — Tenite," in the classified telephone directories of the following cities: Chicago, Cleveland, Dayton, Detroit, Houston, Leominster (Mass.), Los Angeles, New York City, Portland (Ore.), Rochester (N. Y.), St. Louis, San Francisco, Seattle, and Toronto — elsewhere throughout the world from Eastman Kodak Company affiliates and distributors.

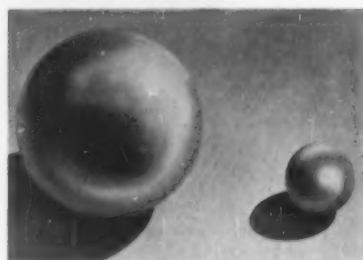


batter's choice



● Juvenile baseball cap produced by American Baseball Cap, Inc., Pittsburgh, Pa. Molded from Tenite Butyrate by Industrial Plastics, Inc., Cleveland, O.

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Products shown above are typical examples of vinyl items produced by the rotational molding process. At top is a tire for use on toy trucks. In the center are two of the many sizes of balls that can be rotationally molded. At bottom is a female mannequin head, illustrating the fine detail of reproduction that is possible. Additional products appear on following pages

about by the resultant compound motion of the mold effectively distributes the plastisol on the interior surfaces of the molds.

The simplest form of commercially available rotational casting equipment¹ consists of a single spindle as

¹ Made by The Akron Presform Mold Co., Cuyahoga Falls, Ohio.

outlined above, with a heating oven around the secondary axis large enough to provide clearance for the rotating mold. Such equipment is suitable for laboratory purposes, pilot units, and small-scale production units where moderately high labor costs can be tolerated in the interests of minimum capital investment.

For most efficient operation of such single-spindle units, two or three sets of molds are necessary. While one set is in the oven for gelation and fusion, the others are being processed for cooling, stripping, drying, and refilling.

Cycle time for gelation and fusion depends on mold thickness, oven temperature, characteristics of the plastisol compound, and other conditions. A range of 8 to 16 min. covers most applications.

Cooling can be accomplished in 1 or 2 min. if cold water immersion or spray methods are utilized. The time required for stripping and drying depends upon the nature of the article and the experience of the operators.

Any rotational casting equipment must perform the minimum basic functions of rotating the mold and providing heat for gelation. Additional functions such as positioning of molds for charging, cooling, and positioning for stripping and drying, may be performed either manually or automatically. One of the popular commercial machines performs all operations of the cycle except stripping, drying, charging, and mold opening and closing.

Although hot air is the most common heating medium for both gelation and fusion, other possible media include steam; hot liquids such as glycerine, tempering salts, and glycols such as carbowax; radiant heat from infra-red sources; and dielectric or induction heating.

Molds are usually cooled by immersion in or spraying with cold water. Use of water, however, involves the subsequent additional operation of removing all traces of moisture before recharging. A blast from an air hose, sometimes aided by warming, is generally employed for mold drying. Air cooling obviates this operation but is not practical because of slowness and large space requirements.

The extent to which the elements of the process will be conveyerized

or automatized will be dictated by the desired production rates and prevailing economic conditions. In general, it is neither necessary nor desirable to complicate a single production unit with automatic features which reduce the remaining labor time below the capabilities of one full-time operator.

In order to achieve a higher degree of efficiency than that afforded by the single-spindle operation described, the next step is to conveyerize the spindles to present them to convenient stations for the remaining operations.

Two basic systems are utilized:

A) The spindles are mounted on a continuous chain conveying the molds and their respective spindles through all the stations of the cycle.

B) The spindles are mounted on a turntable which conveys them to the various operational areas.

One commercial adaptation of the continuous chain system² utilizes single-cavity molds, each mounted on its own rotating spindle. This design is said to incorporate automatic mold opening, filling, and closing, leaving only the stripping and drying operations to be performed manually.

The majority of multiple-spindle machines are based on the revolving table system, utilizing either intermittent or continuous turntable motions.

One commercial design³ utilizing the intermittent table motion provides four spindles carrying multiple-cavity molds. Each spindle is presented in turn to each of four stations located 90° apart. The mold rotates only in the first station position, for gelation in a stream or hot air chamber. The following three stations provide, respectively, for fusion in hot liquid; cooling by immersion in water; and stripping, drying, and filling. This system offers fuel economies, but requires that equal time be devoted to each of the four stations regardless of time actually required. The entire cycle is governed by the station requiring the most time.

By means of the continuous table motion system, each operation may be allotted its proper specific period of time. One popular design of this type⁴ combines gelation and fu-

² Made by Sun Rubber Co., Akron, Ohio.

³ Made by Rempel Mfg., Inc., Akron, Ohio.

⁴ Made by The Akron Presform Mold Co., Cuyahoga Falls, Ohio.



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Rotational molding is not confined to round, square, simple objects. Flamingo lawn decorations of fairly complex shape and posture are rotation molded (legs are metal)

sion in a circular oven occupying 240° of the circle in which the spindles rotate. Cooling is accomplished by means of a water spray in a cabinet through which the molds pass in about one minute. Stripping, drying, and filling are carried on while the spindles are stationary; the table motion carries the molds from the cooling section back to the oven entrance. Complete cycle times are from 12 to 21 minutes. The machine normally carries six spindles, so that a mold is stripped at intervals of 2 to 3½ minutes. Maximum mold dimensions customarily provided are 30 in. in diameter by about 14 in. high.

Molds

Although single-cavity molds are sometimes employed in rotational molding, common practice is to mount several cavities on a common fixture, such as a "spider" or perforated plate, to be rotated and conveyed through the operations as a unit. The type of mold to be employed naturally will be a factor in selecting processing equipment, along with the desired capacity and permissible labor cost.

Aluminum or copper are usually selected as mold materials, because of ease of fabrications and good thermal conductivity. Stainless steel is often used for components where higher strength is desired. Iron molds should not be used unless chrome- or nickel-plated, since iron

as well as some other metals cause decomposition of the plastisol. If copper molds are used, the plastisol must be specially formulated to prevent decomposition or staining when in contact with the metal.

Easily machined shapes are generally best formed by direct machining of aluminum alloy stock. Die-cast aluminum cavities are used when quantities justify the cost. High-quality sand castings are employed for most intricate shapes if high gloss is not required, or if the cost of finishing and polishing is not excessive. For intricate shapes and finest details, especially when undercuts are involved, the plaster mold process is applicable.

A common defect of aluminum castings, especially of the sand and plaster mold types, is the presence



Two types of vinyl syringes produced by rotational molding process

of minute porosity voids. Sometimes not apparent until after fine polishing, these voids or pits can cause high reject rates due to blisters in the plastisol deposit. Cavities containing pits barely visible to the unaided eye have been known to produce blisters as large as ¾ in. in diameter.

Many intricate shapes, such as doll parts and toys, can only be formed by electro-deposition of copper over a wax or elastomeric model. Electroformed copper molds are highly suitable for slush casting because of their low cost, fine detail, and rapid heat transfer. The closure problem is sometimes difficult, and these types of molds are, therefore, generally used only when shape intricacies make other types impracticable.

A relatively new process of mold making—spraying finely atomized metals on a model—has been used to a limited extent.

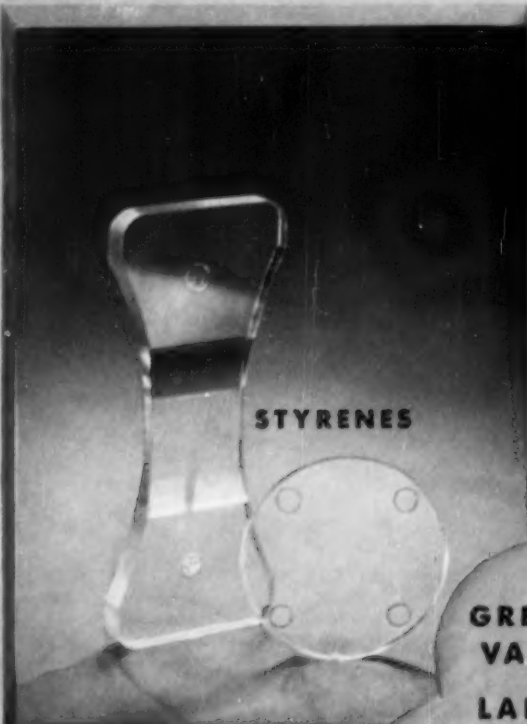
Regardless of material or method, molds for rotational casting must meet certain specifications. Wall thickness should be held to the minimum necessary for strength and dimensional stability, and should be substantially uniform to conduct heat evenly to all parts of the interior surface. Provision must be made for intimate contact of all registering surfaces, and for sufficient clamping pressure to maintain such contact against the stresses resulting from internal pressure and thermal dimensional changes. Provision must be made for attaching cavities or clusters of cavities to the rotational mechanism, in a manner permitting free circulation of air about the cavities. The latter is very important to the attainment of uniform distribution of the plastisol.

Operational Details

Although the basic principles of rotational casting are simple, many potential pitfalls await the inexperienced operator. The following observations point out many of the minor but important bits of "know-how" which are essential to smooth operation.

Stripping of intricate, undercut molds often appears to be a formidable difficulty, especially in the toy field where one-piece copper cavities are employed. Operators quickly acquire deftness in stripping, and the molds require a "breaking-in"

(To page 133)



STYRENES



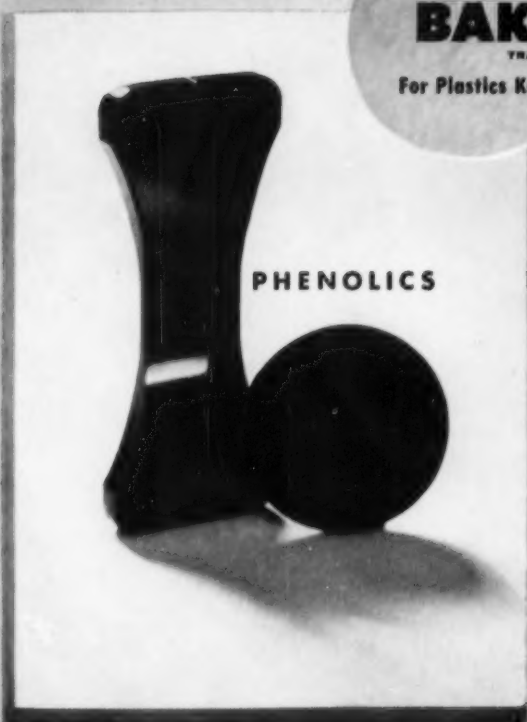
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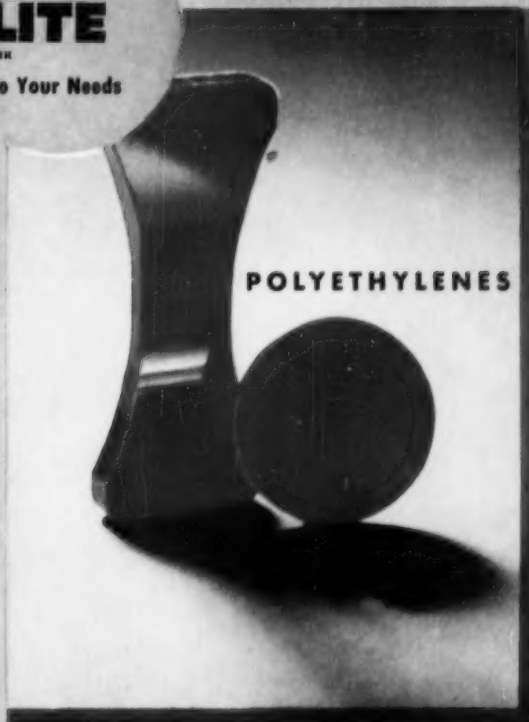
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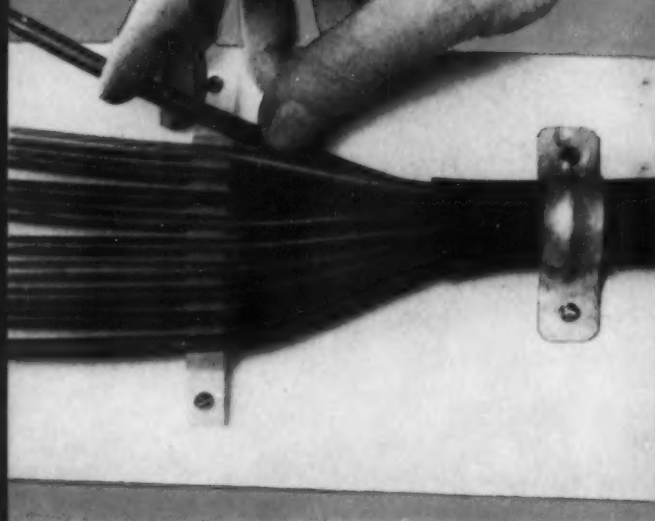
"V-V" Golf Grip molded for **The Kroydon Co.**, Maplewood, N. J., by **Hungerford Plastics Co.**, Rockaway, N. J.

This "professional" golf-grip demonstrates the performance features of BAKELITE Brand Elastomeric Vinyl Plastic VYNW, the material from which it's molded. Attach it to your golf club, and the correct grip is built-in. The club is always held in the right position—every finger in the right place, snugly fitted into the molded grooves.

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"Dekoron" tubing extruded by **Samuel Moore & Co.**, Mantua, Ohio

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Here's why: They are easy to install around corners and through hard-to-reach places. Joint fittings need only be finger-tight. The light weight of the tubes permits their ready mounting on tube racks molded from polyethylene. When required, multiple tubes are supplied in harnesses extruded from BAKELITE Vinyl Plastic.

Extruded or molded, BAKELITE Polyethylene offers many outstanding service properties for a growing list of applications. Learn what it can do for your product.

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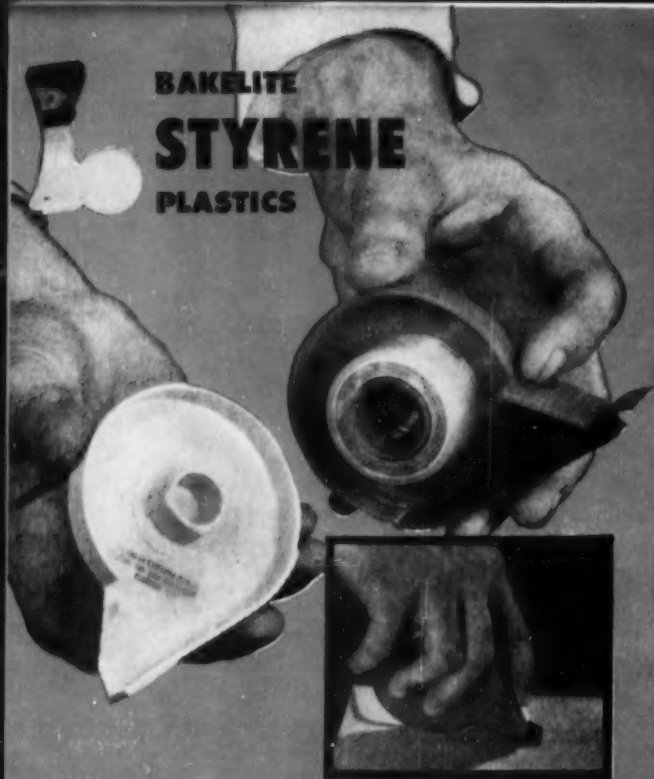
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BAKELITE STYRENE PLASTICS



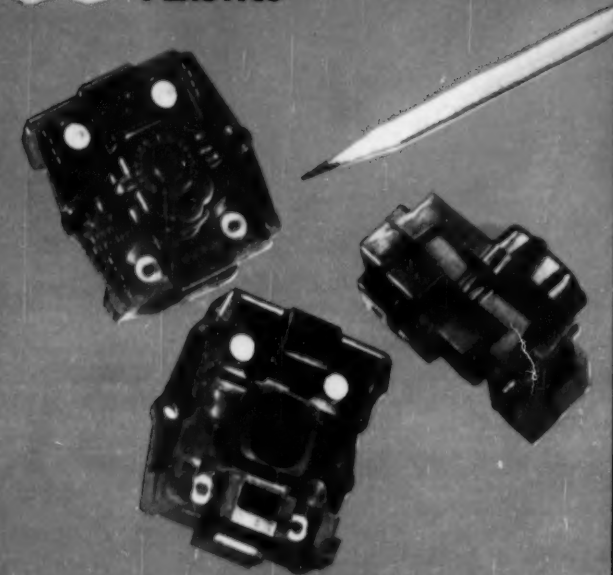
"Tape Rite" dispenser produced by **Cosom Industries**,
Minneapolis 16, Minn.

With this new stick-tape dispenser, you just draw the tape along a surface to the desired length. Bend the dispenser back, and the serrated metal spring edge cuts the tape. It's all done with a minimum of fuss, a maximum of neatness.

And the case is a perfect match for the job. Molded from BAKELITE Brand Styrene Plastic SMF-3500 it has fine, clean details, glossy surface, bright colors. Its two halves close with a firm, even fit. Light weight makes it easy to handle.

In comparison with other general-purpose styrenes, SMF-3500 provides easier flow at conventional molding temperatures, resulting in faster molding cycles. SMF-3500 also has outstanding clarity for jobs requiring excellent transparency in crystal or in colors.

BAKELITE PHENOLIC PLASTICS



Contact block molded by **Furnas Electric Company**,
Batavia, Ill., for their series "S" Pressure switches for pumps
and compressors

Molding cycle time cut 20 per cent! That's what the manufacturer reported when BAKELITE Brand Phenolic BMC-5000 Black 25 was adopted for the molded blocks illustrated. And lower specific gravity resulted in a 5 per cent saving in material. In addition, BMC-5000 provided "ease of handling and good mold release qualities."

BMC-5000 Black 25 provides fast curing speed with all molding techniques. It can be molded over a wider time range than other general-purpose phenolics. Its good pre-heating latitude permits considerable delay in transfer time from preheat to mold closing, without pronounced knit, weld, or flow lines resulting. The excellent blend-to-blend uniformity of this material is the result of rigid quality control during production.



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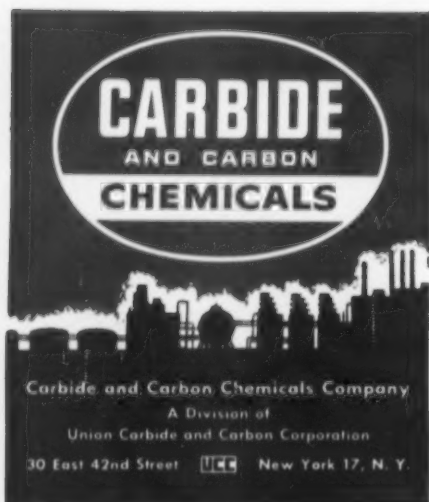
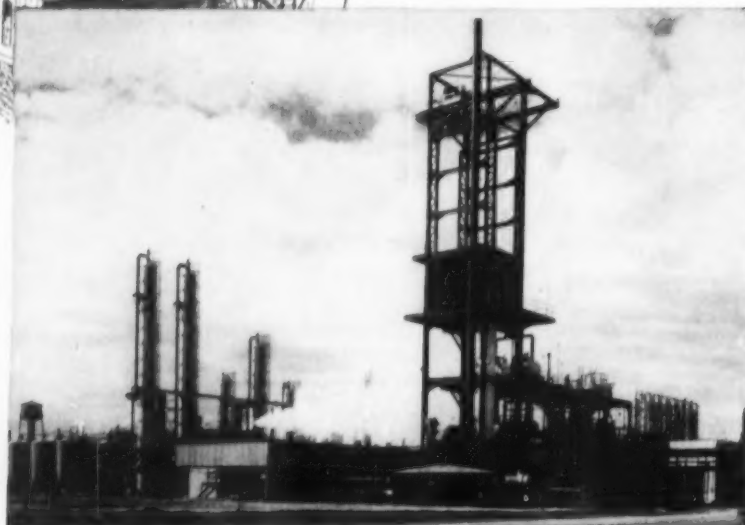


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period after which the solidified plastisol is released more easily. The use of parting agents will facilitate breaking in new molds, but should be avoided if the articles are to be painted.

The importance of thorough mold drying cannot be over-emphasized. Minute traces of moisture will invariably cause defective parts due to blisters.

Plastisol compounds procured from reputable suppliers are processed under high vacuum to remove included air particles. Faulty handling and dispensing methods may introduce air into the compound, which will also cause blister-like defects.

Most plastisol formulations permit a reasonable latitude in processing temperatures. However, extremely high fusion temperatures will cause degradation of the components with evolution of hydrogen chloride and other gases, which also affect product quality. Under-fusion, on the other hand, causes deficiency in tensile strength and tear resistance.

Uniformity of thickness is a complex subject, and no specifications can be laid down to cover all circumstances. Deliberate production of thicker or thinner sections can be obtained by making the mold thicker or thinner in various sections. This produces a non-uniformity in heating and differential gelling, thereby causing some parts to be thicker than others. Theoretically, during the gradual conversion of the plastisol from the fluid to the solid state, the ungelled portion of the mass must remain at the lowermost portion of the mold cavity at all times; also, throughout the gelation stage, all parts of the mold surface must be presented to this lowermost portion for deposition for approximately equal times. Principal variables affecting this ideal condition are:

- 1) R.p.m. of the main spindle axis.
- 2) Gear ratio, or r.p.m. of the secondary spindle axis.
- 3) Viscosity-temperature curve of the plastisol.
- 4) Temperature-time gradient of the contained plastisol or, indirectly, the rate of heating the mold during gelation.
- 5) Presence of irregularities and pockets in the shape being formed, affecting the rate of flow of liquid over various areas.

6) Flow characteristics of the plastisol formulation.

7) Ratio of weight (wall thickness) to cavity volume.

For example, it would seem that a high rate of mold revolution speed would be conducive to more uniform distribution. However, as the plastisol is converted from the fluid to the solid state, its viscosity, and hence flow characteristics, varies widely. A compromise must therefore be made in spindle speed so that the ungelled portion of the plastisol is retained by gravity at the lowermost portion of the mold at all times, including the near-terminal stage when the viscosity is from four to eight times that of the initial storage temperature.

Furthermore, in multiple-cavity molds of large diameter, centrifugal force sometimes influences optimum spindle speeds.

The subject of gear ratio, or ratio of respective speeds of the primary and secondary shafts, is controversial and not too well understood because of the lack of fundamental research. Under certain circumstances, a wide variation in gear ratios can be tolerated with little apparent effect on deposit uniformity—particularly in the case of thick-walled articles. In the majority of applications, the gear ratios vary from 4:1 to 5:4.

Plastisol Formulations

Compound suppliers can formulate plastisols to meet a wide range of specifications and processing demands, providing adequate information is supplied.

Two distinct categories of specifications are necessary:

1) *The liquid plastisol specifications.* A description of the process to be used and articles to be made will establish the properties of the liquid compound which affect its performance during manufacture. For example, viscosity, flow characteristics, gelation and fusion temperatures, color, and compatibility with various mold metals, can be adjusted to meet specific jobs.

2) *The specification requirements of the finished article.* As much information as is possible should be given the compound supplier regarding the following properties desired in the fused film together with an indication of their relative importance: Durometer range; re-



The toy field is one of the major outlets for items produced by rotational molding. Typical products are shown above. At top is a squeezable letter block, with raised border and letters. In center is a decorated doll head. At bottom are two doll shoes. The rotational molding equipment and the molding techniques that are being used to make these toy items are described in the accompanying text

siliency; resistance to heat and/or cold; stability of color upon light exposure; resistance to attack upon painted surfaces; abrasion resistance; tensile strength; resistance to oils, solvents, soapy water, etc.; toxicity-free requirements; gloss; and dimensional stability.

Plastisols must be custom-made to fulfill specification requirements. Close cooperation between the compounder and the molder is therefore necessary to obtain best results.

FORMING TEFLON

for Electrical Uses

by ROBERT L. HIBBARD*

THE unusual insulating properties of Teflon polytetrafluoroethylene are responsible for the phenomenal growth of its use in the electrical industries. Even so, a number of misconceptions still exist, including the following:

- 1) Parts are un moldable.
- 2) Use with metal inserts or shells is difficult.
- 3) Teflon-metal seals are unsatisfactory.
- 4) Tolerances are variable and stability unsatisfactory.
- 5) Density is non-uniform and

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Adapted from a paper presented at the Electronic Materials and Components Symposium held in Philadelphia, Pa., June 2 and 3, under the joint sponsorship of the Institute of Radio Engineers and the American Institute of Electrical Engineers.

properties are inconsistent from batch to batch.

These misconceptions arise from early problems which have now been encountered often enough so that considerable experience has been gained with each. All the answers are not yet available, but progress has been made, some of which is reported here. The case history of a complex molded terminal block will illustrate how a difficult Teflon molding was successfully made.

Terminal Block

A manufacturer needed the properties of Teflon in a terminal block to 1) save space; 2) eliminate breakage; 3) accommodate higher

temperatures; 4) eliminate moisture absorption; and 5) eliminate carbon tracking.

To meet these requirements, a Teflon terminal block was designed; then came the problem of making it. Two of the completed terminal blocks are shown in Fig. 1. Note that the six upper separators are four times higher than they are thick. Also note the lower separators and the "counterbored" lugs. Analysis showed machining to be too costly, so a proposal was submitted based on molding. Initially, there was considerable difficulty, so the customer's first requirements were supplied by a combination of molding and machining. Shortly, however, the molding process was

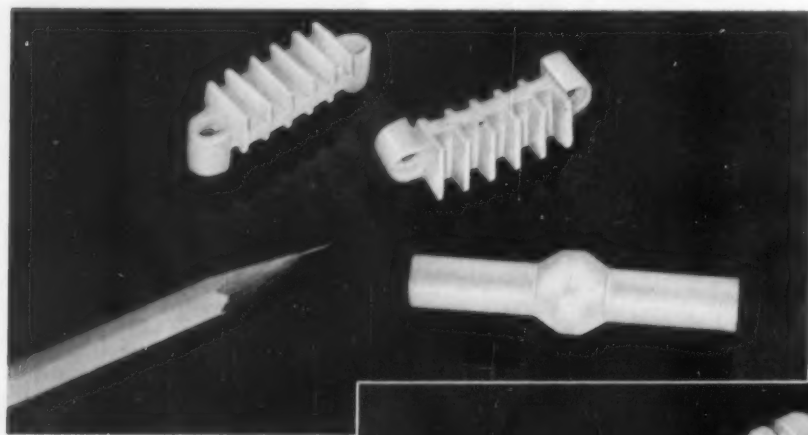


Fig. 1 (left)—Complex terminal blocks (upper part of photo) are molded of Teflon; simple bushing (lower right-hand part of photo), required only in small quantity, is economically machined from Teflon rod

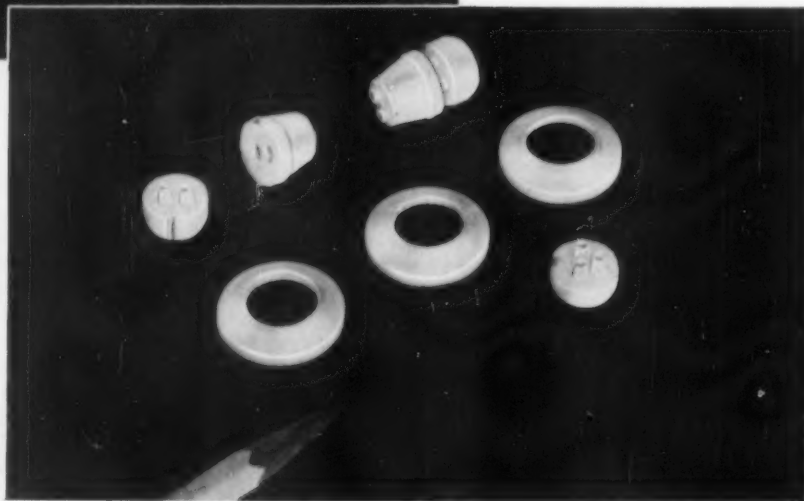
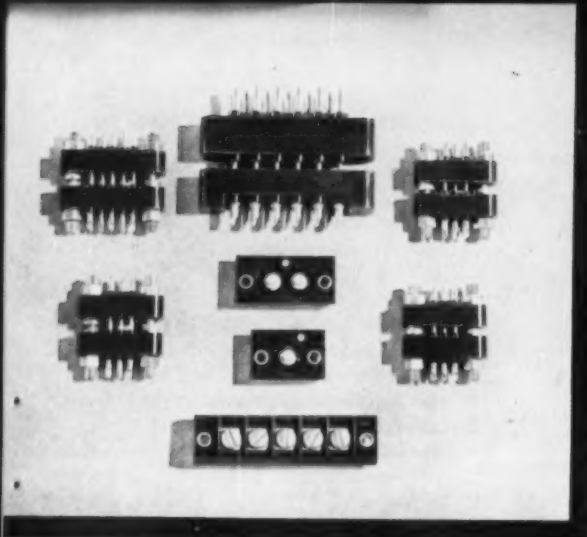
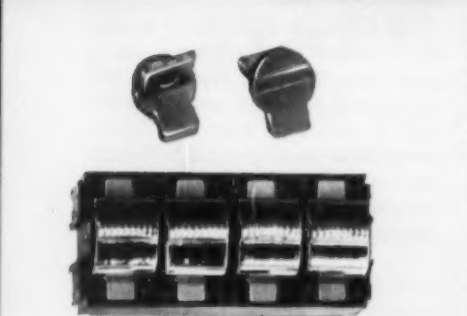


Fig. 2 (right)—Typical Teflon moldings for use as connector inserts and spacers. In each case, moldings give a level of quality not obtainable with machined parts

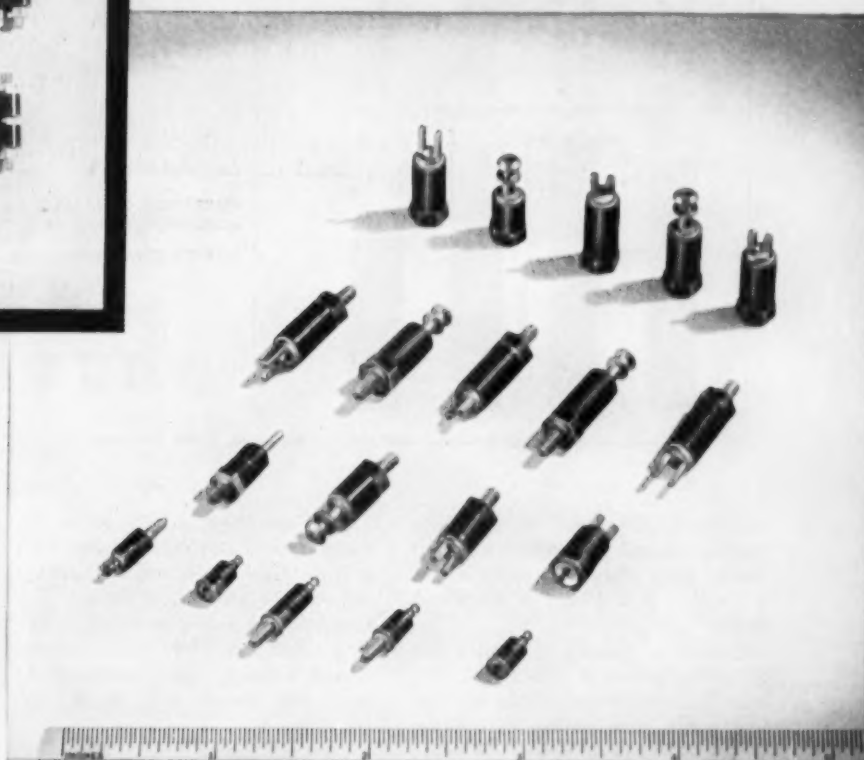


Multi-contact connectors molded of Cyanamid's Melamine No. 592 by Armel Electronics, Inc., Brooklyn, N. Y.

Standoff terminals molded of mineral-filled Melamine No. 592 by Whitso, Inc., Schiller Park, Ill.



Automobile window-lift plungers molded by Whitso of cellulose-filled Melamine No. 1500.



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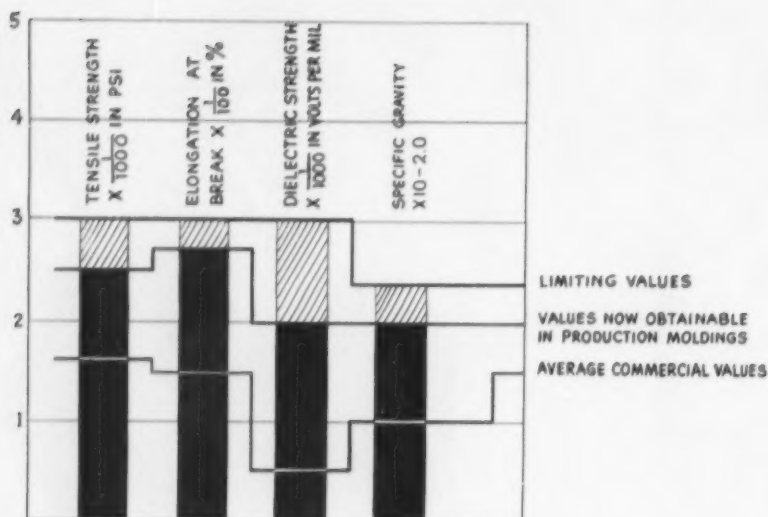


Fig. 3—Some theoretical, practical, and average values for Teflon properties

sufficiently developed to eliminate machining, and all-molded terminal blocks have since been supplied at a fraction of the cost of machined pieces.

This case history illustrates the following points of interest:

1) Teflon terminal blocks are being used, in quantity, to replace thermosets where space, dielectric strength, and breakage are important factors.

2) When there is real incentive, such as a large potential saving over machining, surprisingly complex shapes can be molded.

Machined, Not Molded

In contrast, the bushing, also shown in Fig. 1, is being machined, not molded. There are two reasons:

1) the quantity is only moderate, making mold amortization costly on a piece price basis; and 2) machining such a piece is a simple, low cost lathe or screw machine operation. Only in very large volume would molding be considered to save the Teflon now going into shavings.

Figure 2 shows some typical Teflon moldings being used for connector inserts or spacers. They are of particular interest, since, in each case, molding gave a level of quality unobtainable with machined parts. It is worth remembering that top quality, here in the form of high

density, high dielectric strength, and general toughness, is fully as good a reason as cost to specify molded Teflon over the machined product.

For example, Fig. 3 illustrates how suitable process control can result in Teflon moldings capable of improved performance. The line showing limiting values represents the maximum reported data in each case. The next two lines contrast the high level of properties now obtainable in moldings with the average values of commercial general-purpose extruded Teflon rods, tubes, or slabs.

Metal-Teflon Seals

Judging from requests for technical assistance, the need for use of metal with Teflon is growing in the electrical field. Some trouble seems to be encountered when the Teflon-metal joint must remain leak-tight after repeated temperature cycling, anywhere from -65 to 350°F . The damaging effect on Teflon-metal seals of temperature cycling or, more accurately, differential thermal expansion combined with cold flow, is well known. However, this problem has been successfully overcome in several ways. A case in point is a polarized coaxial connector (Fig. 4).

The customer had solved the seal problem around the O.D. of this piece, but was having difficulty with leakage in the area of the brass conductors, which were originally press fitted into place. Temperature

Table I—Some Criteria for Good Design in Teflon Fabrication

| | |
|----------------|--|
| Moldings | Upsets: 4:1 maximum ratio |
| | Radii: Use to blend sections of different thickness where possible. |
| | Draft Angles: Seldom needed |
| | Thickness: 0.040 minimum in any extensive area |
| Use With Metal | Proportions: Avoid thin metal and thick Teflon laminates |
| | Structures: Metal confining Teflon strong enough to stand thermal expansion stresses |
| Seals | Plastic Flow: Compensate by prestressing or spring-loading |
| | Sealing Loads: 800 to 1500 p.s.i. needed in sealing area |
| Tolerances | Generally: ± 0.005 per in. of dimension for moldings |
| | ± 0.002 per in. of dimension for machining |
| | Avoid: "Closed loop" tolerance systems leaving no room for process corrections |

Fig. 4—Teflon coaxial connector is leak-proof under temperature changes

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**ORGANIC
8-V-1**

Chelating agent, more than two times as effective as common organic phosphites. Inactivates harmful by-products to boost stability. Contributes to top clarity.

**ORGANIC
7-V-2**

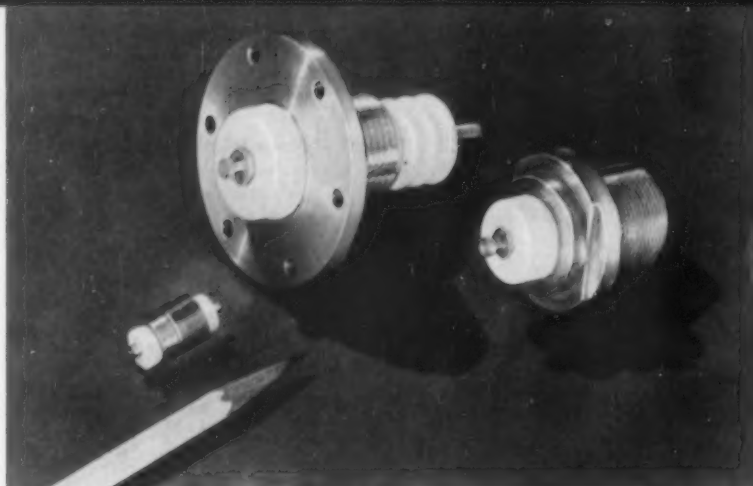
Epoxy assistant, highly effective HCl scrubbing agent, undiluted. Will extend stability for longer processing periods.

**CADMIUM
28-V-2**

For rigids, opaque to translucent. Stabilizes unplasticized resin efficiently and economically, with minimum effect on physical properties of product.

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- CADMIUM 2-V-7:** For modified solutions and organosols.
- CADMIUM 24-V-1:** Organic liquid complex for highest attainable clarity, used principally with dispersion resins.
- CADMIUM 2-V-400:** Modified 2-V-4.
- CADMIUM 2-V-8:** Selected laurate, used principally with low fusing resins.
- BA-CD 12-V-5:** Coprecipitated laurate.
- CADMIUM 22-V-1:** For rigid, clear and opaque stocks.
- ORGANIC 7-V-1:** Epoxy assistant.
- ORGANIC 7-V-4:** Epoxy assistant, for rigids.
- BARIUM 1-V-3:** Dispersible stearate, to contribute lubricity with barium effects.
- BARIUM 1-V-6:** For asbestos filled fill.
- BARIUM 1-V-7:** Liquid, for modified plastisols and organosols.
- CALCIUM 5-V-1:** Dispersible stearate, to contribute with calcium effects.
- CALCIUM 5-V-22:** Dispersible, low melting stearate to reduce internal friction.
- ORGANIC 8-V-100:** Modified 8-V-1.



All illustrations with this article courtesy The Jaclin Mfg. Co.

Fig. 5—Teflon hermetic seals. These seals remain leak-tight from -65 to 350°F .

cycling from -65 to 300°F . was involved. This problem was solved by first cutting a series of grooves in the conductors. The Teflon was then molded around in the conductors so as to completely fill in these grooves. On cooling, the Teflon contracted radially and axially relative to the brass. Radial contraction actually helps the seal, so on cooling, the grooves were not needed. However, on heating, the Teflon expands radially and axially, and will allow leakage unless the grooves on the conductors develop stresses opposed to the axial expansion and thus maintain a seal. As a further precaution against leaks, in this case, the Teflon was prestressed to hug the conductors. By an extension of the technique just described, Teflon "hermetic" seals are being produced consisting only of Teflon and metal.

Figure 5 shows three such seals now in use. These seals remain leak-tight from -65 to as high as 350°F . In view of the high expansion rate of Teflon, its tendency to yield gradually under sealing pressures, and the fact that no rubber or other spring components are used, these seals give a conclusive

demonstration of how the apparent limitations of Teflon can be overcome, and in fact, utilized to achieve a successful design.

Bonding to Metal

Figure 6 illustrates two items in which the Teflon is actually bonded to the metal. The first is a Teflon dispersion-coated strip of aluminum foil. The use conditions of this laminate require high bond strength between the aluminum and the Teflon. The strength obtained approaches, and sometimes exceeds, the strength of the Teflon itself.

The second item in Fig. 6 is an electrical instrument control shaft with Teflon inlays to prevent O-ring sticking and increase O-ring life. These Teflon inlays are bonded to grooves in the stainless steel shaft. The result is a useful structure which, at first analysis, might appear impractical to manufacture.

These case histories of electrical applications illustrate a number of advances in handling Teflon, which can be summarized as follows:

1) Surprisingly complex but form-stable Teflon moldings can be made.

2) When there is sufficient volume or machining waste to amortize mold costs, molding should be considered as the way to make many Teflon parts.

3) By proper process control, moldings of high density and dielectric strength can be made which will outperform parts machined from extruded stock.

4) The presence or absence of prestress in Teflon moldings can be controlled to the advantage of the user.

5) Thin layers of Teflon can be successfully bonded to many metals, in a variety of shapes, as well as to ceramics.

Table I summarizes some general design considerations. Whereas it is difficult to assign quantitative values, the principles listed should prove helpful.

Evaluation Procedures

Users will be interested in some methods of evaluating Teflon quality. The usual techniques of dimensional inspection are well known. Less well known are some simple methods used to judge: 1) form stability; 2) degree of internal strain; 3) density; and 4) uniformity.

The test for form stability is based on the known use conditions of the part. For example, if a part is to be used from -65 to 350°F ., the piece should be form-stable in this temperature range. Loads or external strain must also be considered. Accordingly, it has proved satisfactory to impose the known external strains on the specimen and, while these loads are in effect, to temperature-cycle the piece several times over the known use range. The degree of distortion observed should, of course, be within the limits which the use can tolerate.

In most instances, this test is sufficient to evaluate the form stability of a proposed design. Occasionally, where long term loads and thermal stresses are involved, it is necessary to supplement the procedure described, either by an accelerated test under more severe conditions or, preferably, by an actual use evaluation.

Internal Strain

The question of internal strain is one frequently raised about Teflon, because the material has a high de-

Fig. 6—Electrical instrument control shaft (left) and dispersion-coated strip of aluminum foil (right) illustrate two applications in which Teflon is bonded to metal



gree of plastic memory. The plastic memory shows up with increasing temperature as a progressively increasing tendency for a piece to revert to its strain-free shape. (See Fig. 7.) The driving force which causes the Teflon to exhibit plastic memory is defined as internal strain. It has been shown in the case of the hermetic seals that internal strain can be put to work. But the question is: how can the degree of internal strain be measured and what standards can be used to judge when it becomes excessive?

When there has been sufficient deformation of a material, with resultant strain, to break a significant number of particle-to-particle linkages, the quality of the product is generally lowered. In short, a good Teflon molding or extrusion should be held together by a continuous three-dimensional network of these particle-to-particle linkages. A Teflon part which has this system in an unbroken state can have high dielectric strength and good toughness. Fractures or interruptions, of course, lower dielectric strength, sometimes markedly, as well as reduce mechanical strength.

The key to this test is the fact that Teflon's plastic memory is complete within 30 min. at a temperature of 650 to 700° F. Accordingly, a part which is suspected of having excessive internal strain may be treated under these time-temperature conditions and the resulting shape compared to the preform. If there are areas where the Teflon has failed to return to its preform shape at the conclusion of this test, it is safe to conclude that the continuous system of linkages has been broken. Good ventilation is a necessary part of the test set-up.

Uniformity

Another important property of fabricated Teflon is density and uniformity. Shapes are made by a sequence of preforming, sintering, and squeezing operations identical in principle to those employed in powder metallurgy. It is easy to see why good process control is necessary to obtain a uniformly high degree of consolidation in the end product. A 5% difference in density in Teflon, for example, can make a 100% difference in dielectric strength. This effect is illustrated semi-quantitatively in Fig. 8.

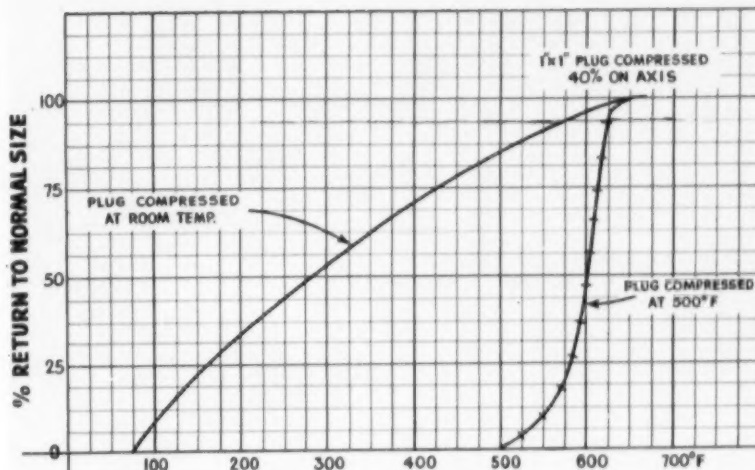


Fig. 7—Typical plastic memory behavior of Teflon polytetrafluoroethylene over a wide temperature range. Degree of plastic memory increases with increases in temperature

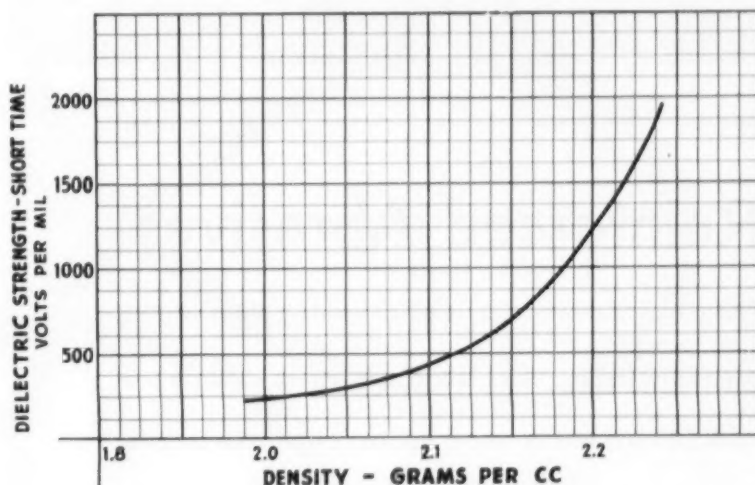


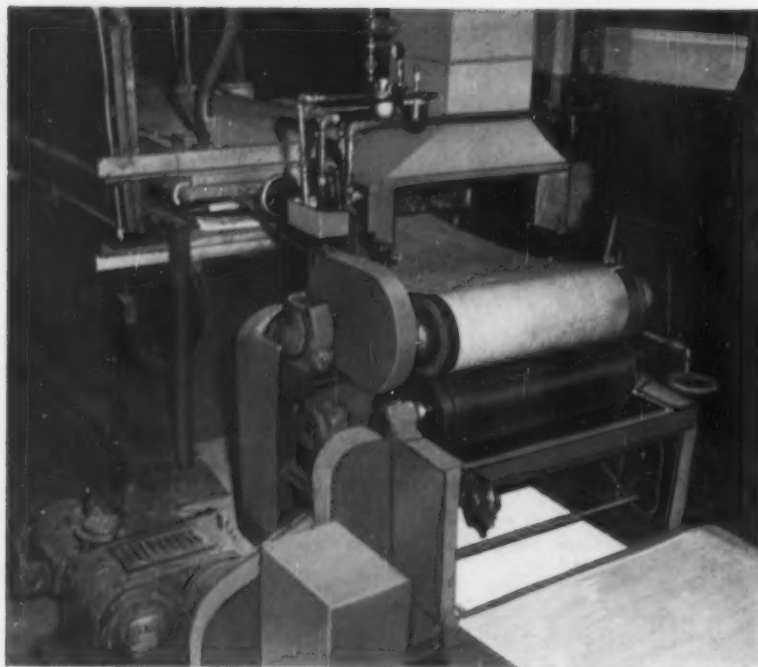
Fig. 8—Effect of changes in material density on variations of dielectric strength characteristics, as determined for a 1/16-in. molded Teflon tetrafluoroethylene sheet

The average density of a Teflon piece can be determined by any number of well known methods. In general, these methods determine the weight and volume, from which density is directly calculated. Uniform density is as important as average density. Fortunately, uniformity can usually be judged simply by appearance. Teflon of uniform density is uniform in appearance, with every section of like thickness having a like degree of opacity. Some translucence or pearl-escence is obtained at a limiting density between 2.20 and 2.25 g./cu. centimeter. The presence of "snow" in some areas, contrasted with par-

tial translucence in others, is a sure sign of density variations which may cause trouble.

Conclusions

When Teflon is to be used, it is necessary to design each part from available basic information. Seldom can Teflon as a material be successfully substituted per print for some other material. Similarly, mold designs, processing techniques, and fabrication methods must be tailored to the material. When both the designer-user and the fabricator study the common problem, mutually successful applications are readily attainable.



All photos with this article courtesy The Carborundum Co.

Fig. 1—In making one type of reinforced abrasive wheel, grain-fabric web is dip-impregnated in liquid phenolic (foreground); volatiles are removed in drier (rear)

Reinforced Abrasives

Phenolics and other resins, used for bonding abrasive grits, are reinforced by felted fabrics and woven cloths to produce grinding wheels with a number of superior features

by P. L. SHANTA*

PLASTICS, especially polyesters, phenolics, and epoxies, have been reinforced by various methods to render them more useful. Likewise, resin-bonded abrasive products have been reinforced to make them safer to operate, to increase their utility, and to improve their performance.

The most widely used resins for bonding abrasive grits such as silicon carbide and aluminum oxide are phenolics. Straight phenolics suffice for many products but specialty applications call for phenolics modified with polyvinyl butyrals, acetates, and chlorides, and others. In addition, materials such as alkyds, shellac, and natural or synthetic rub-

bers, are used to bind the abrasive grits.

When phenolics are the selected materials, one-step resins are normally used where impregnation of a fabric or cloth is concerned and two-step powdered phenolics where an abrasive mix is used.

Two main categories of reinforced wheels are manufactured by The Carborundum Co. The first is the MX line of wheels laminated from resin-impregnated, felted cellulosic fiber grain-included fabric. The fabric is made by "aerodynamic weaving" or wet felting (2, 3, 5, 6, 11, 12)¹ and the abrasive grain is added to

¹Numbers in parentheses link to references on p. 149.

the continuous web of non-woven fabric as the fabric is being made.

The grain-fabric web is impregnated with phenolic resin (usually a one-step) (9), dried, die-cut to shape, and laminated.

Figure 1 shows the fabric being dip-impregnated in a liquid phenolic resin and entering a horizontal drier to remove volatiles. After being dried, the impregnated stock is slit into desired widths and cut into lengths. The cut pieces are then stacked in groups and cold-pressed (10) to cause the individual sheets to adhere to one another. (See Fig. 2, p. 146.) Once cold-pressed into slabs, the slabs are die-cut (See Fig. 3); resulting pieces are hot-pressed into laminated abrasive wheels.

During hot-pressing, cellophane is used as a parting agent and becomes an integral part of the article.

Figure 4, No. 1, shows three disks of the raw material, each with different abrasive grit sizes incorporated in the cellulose. Number 3 is a completely finished abrasive wheel. In some cases, such reinforced abrasive products are further reinforced (4) as shown in No. 2 of Fig. 4. Here, a sheet of resin-impregnated canvas or duck is placed between the first and second sheets of abrasive stock. Likewise, several disks of latex-treated nylon mesh are placed between the lowest two layers of abrasive material. The canvas near the top surface provides more strength so that a greater force is required to break the wheel. On the other hand, the latex-treated nylon mesh near the bottom surface provides a medium to which the pieces will adhere should the wheel break.

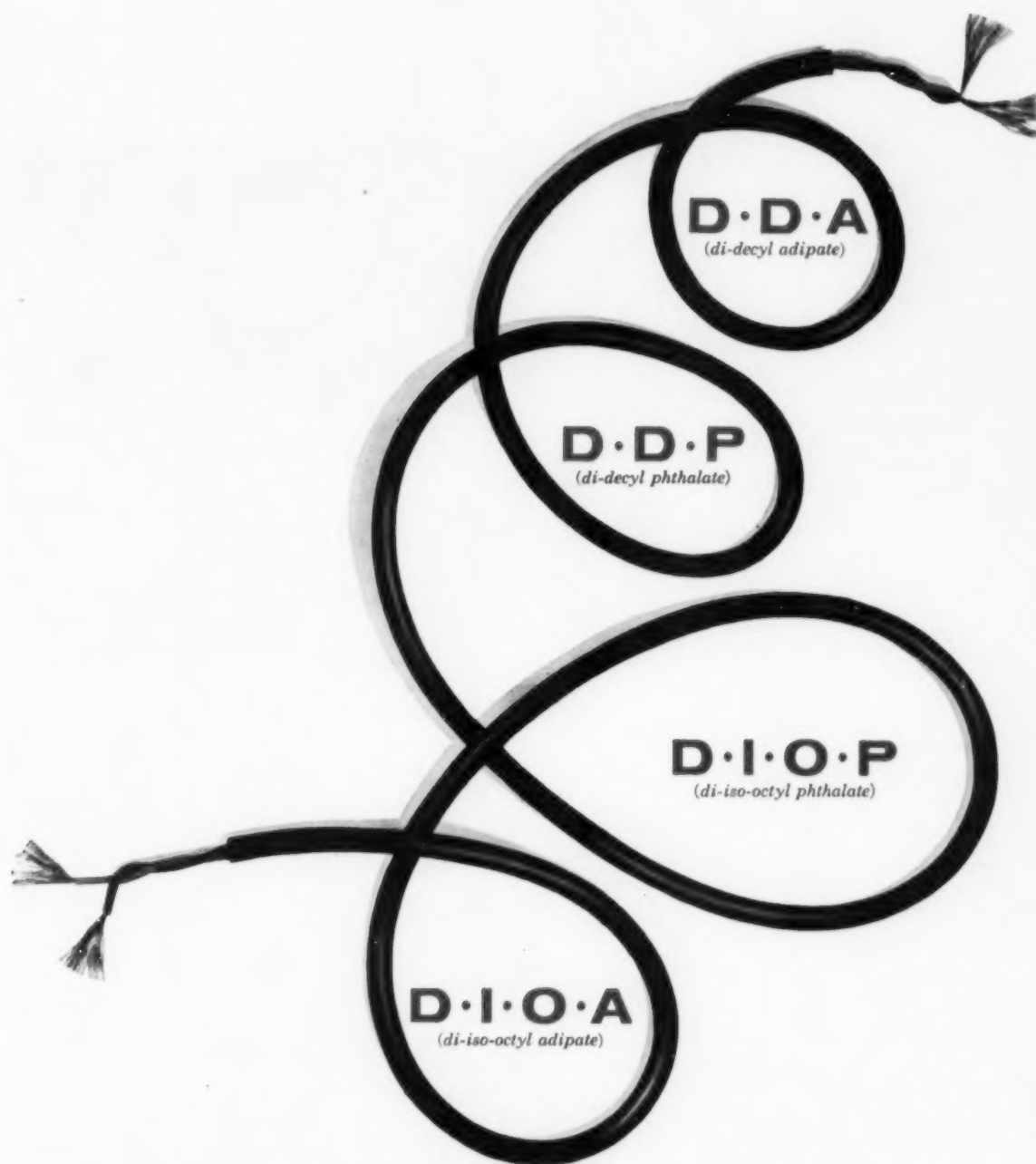
The impregnated roll stock is not always handled as described. Sometimes it is simply slit into narrow widths and wound on a mandrel. Winding is continued until the diameter of the finished wheel is reached. This coil is then hot-pressed to a fiber backing. Number 4 in Fig. 4 shows an abrasive disk made by the coil method (1).

Glass Reinforced Wheels

The second main category of reinforced abrasive wheels is produced by the lay-up method wherein alternate layers of abrasive mix and disks of glass cloth (8) are charged into a mold, pressed, and oven-cured.

In its line of Carboflex glass fab-
(To page 146)

*Supervising engineer, The Carborundum Co.



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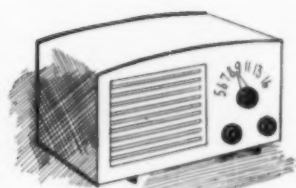
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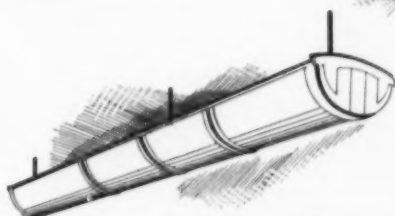


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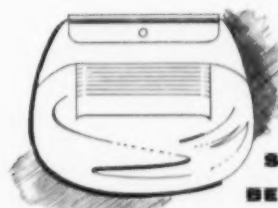
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Fig. 2—After impregnated stock has been dried, slit to required width, and cut to length, it is stacked and cold-pressed to adhere individual sheets to each other to form slabs

ric-reinforced abrasive products, Carborundum uses disks of open-mesh glass cloth with layers of abrasive mix to produce a strong, break-resistant abrasive wheel.

Abrasive Mix Preparation

The abrasive mix which later constitutes the working portion of the abrasive wheel is made from abrasive grain (fused aluminum oxide or silicon carbide), a liquid grain-wetting agent, a powdered two-step phenolic resin, and a filler.

The abrasive grain is wet (Fig. 5) with a grain-wetting agent such as a liquid phenolic resin, furfural, or a furfural-cresol mixture in a Lancaster counter current mixer. Powdered resin and filler are added to the wetted grain at specified intervals to give a free-flowing mix in which the abrasive granules are coated with resin and filler.

Glass

Glass cloth such as HG-X-50 or HG-89,² with a sufficiently open mesh to permit knitting of the abrasive mix introduced from both sides of the cloth, is purchased in rolls and die-cut into disks which are somewhat smaller in outside diameter than the finished article to facilitate lay-up in the mold.

After the abrasive mix is made as shown in Fig. 5, the mix is poured

² Manufactured by Hess, Goldsmith and Co., Inc.

into a mold and levelled off as shown in Fig. 6. In Fig. 7 the workman is placing a disk of glass cloth into the mold. A layer of mix is applied over the cloth and this process is continued until the required number of glass plies and abrasive mix layers have been introduced. Hot-pressing follows.

When stripped from the hot press,

the wheels are loaded between ceramic bats and cured in an oven. Figure 8 illustrates the method of rack loading used. The entire rack is placed into the oven.

After curing, the wheels are finished and inspected. One finishing operation involves the removal of the excess phenolic at the periphery of the wheel. This edge, as molded, is filled out smoothly with resin. This resin must be removed to expose abrasive grits so that the wheel will start to cut immediately after being mounted on the machine on which it will be used.

Grain Wetting Agent

Actually, the grain wetting agent referred to previously is not a wetting agent in the true sense as defined by technologists.

The purpose of this agent is to cause the powdered phenolic resin to adhere to the individual particles of grit so that a free-flowing mix will result. Adherence of the powdered phenolic to the abrasive grit is achieved by mechanical or solvent action. The liquid phenolics perhaps accomplish both. First, they have a viscosity of 200 to 500 cp. and will mechanically hold the powdered resin. Secondly, they have a slight solvency action for the powdered two-step phenolic. This solvency, of course, leads to an increase in vis-

Fig. 3—Cold-pressed slabs are die-cut to shape; resulting pieces are hot-pressed into abrasive wheels; cellophane, used as parting agent, becomes integral part of wheels



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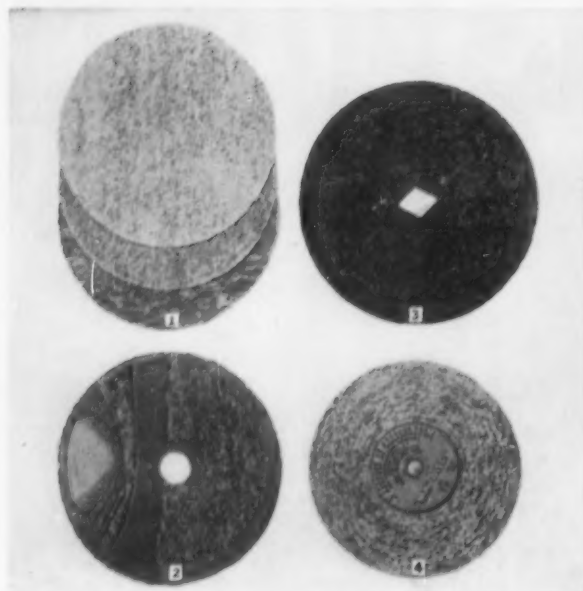


Fig. 5—Preparatory to making lay-up type of reinforced abrasive wheel, abrasive grain is wet with a liquid resin in mixer

Fig. 4—Raw materials for abrasive wheels and end products. For explanation of numbers, see text, p. 140

cosity of the liquid resin as well as added tackiness which then promotes greater mechanical adhesion.

The action of furfural is probably entirely by solvent action for the resin whereas a neutral creosote oil promotes fluffing up of the bond with little or no solvency or mechanical adhesion to the grit. The action of a furfural-cresol mixture as the wetting agent is similar to that of furfural alone.

The straight or modified phenolic resins used in reinforced abrasive wheels are ground so that a major portion of the resin passes 200 mesh. The ultimate particle size and distribution are governed by the choice of the wetting agent and the final product being manufactured.

Various inorganic fillers can be added to the mix. Among those used are cryolite, pyrites, carbonates, sulfates, and fluoborates. The most widely used is cryolite.

To achieve various grades of abrasive wheels, changes in compositions, densities, constructions, etc., are required. Generally speaking, the higher the abrasive content (with lower bond and filler content) the faster the cut. The higher the density or, more accurately, the lower the porosity in a wheel composition, the longer the life. Various densities are achieved by varying the pressures during pressing, the press platen temperature, press hold time, and oven cure.

Unlike most reinforced plastic

articles, the reinforced abrasives are given an after-bake to enhance their performance. Wheels with only a press cure generally wear out too rapidly. Long after-cures of from 8 to 72 hr. are not uncommon. The cure temperature, length of cure, and curing rate, each has a definite effect on how the product will perform in service.

Physical Properties

Table I lists three important physical properties which have been enhanced by incorporating some type of reinforcing medium into abrasive cutting-off wheels. With any of the reinforcements, bursting speeds, and impact and flexural strengths are increased. Each of these increases is substantial.

Bursting speeds are calculated from the revolving speeds at which the wheels fly apart. This is done on a "speeder" which progressively increases the speed of the wheel until it bursts. With various reinforcing media, bursting speeds are increased by 35 to 100 percent.

Impact strengths, calculated on a foot-pounds per square inch basis to take variable wheel thickness into account, are increased by 66% to over 300%; flexural strengths are 2 to 7 times as high as non-reinforced products.

Such increases in the values of the important physical properties have led to broad acceptance of the rein-

Fig. 6—After thorough blending, abrasive mix, consisting of abrasive grain, liquid resin, powdered resin, and filler, is poured into a circular mold and leveled off



forced abrasive products by those who use them in the field.

This discussion has covered methods used by an abrasive manufacturer for strengthening its products. Some of these techniques may be applicable to other plastics processes. And of further interest to the plastics industry is the fact that the reinforced abrasives described have use in finishing operations an other reinforced plastics.

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Table I—Physical Properties of Reinforced Abrasive Wheels

| Type of reinforcement | Bursting speed | Impact strength | Flexural strength |
|-------------------------|----------------|--------------------------|-------------------|
| | surf. ft./min. | ft.-lb./in. ² | p.s.i. |
| 1. Non-reinforced | 20,000 | 75 | 1000 |
| 2. Laminated | 27,000 | 125 | 2000 |
| 3. Glass: Semi-rigid | 30,000 | 300 | 5000 |
| 4. Glass: Very rigid | 40,000 | 400 | 7000 |

Fig. 7—Disk of glass cloth, cut to correct size, is placed into mold filled with abrasive mix; additional mix will be poured over glass cloth, additional glass cloth placed over mix, etc. until required layers of cloth and mix have been reached. Entire assembly is then hot-pressed



Fig. 8—Reinforced abrasive wheels, after having been stripped from hot-press, are loaded between ceramic bats on racks. Racks will be placed in ovens to cure the wheels



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Methods of Study of

High-Temperature Properties of Plastics

by W. F. BARTOE†

A STUDY of the high-temperature properties of organic plastics must include a consideration of 1) their thermal degradation resistance, 2) their dimensional stability, and 3) their useful strength. These factors are sometimes confused and often poorly defined in both spoken and written comparisons of various transparent plastics. The following somewhat generalized discussion is presented with the hope of clarifying the picture. The data presented are intended only to illustrate some of the results of the methods of study we have employed for comparatively evaluating materials.

Organic plastics are generally amorphous in nature. This is particularly true of transparent plastics, which are usually also homogeneous. They are large molecules constructed primarily from carbon, hydrogen, and oxygen, held together by chemical valence and physical attraction bonds. Such building blocks produce physical properties that are considerably different from those observed in metals. These plastics show no sharply defined melting point. Their stress-versus-strain and stress-versus-time relationships are complex and their resistance to the degrading effects of heating, particularly in the presence of air, is relatively poor compared to that of metals. These shortcomings are the sacrifice that must currently be made to obtain a combination of transparency, low unit weight, and high resistance to breakage.

Since transparent plastics do not show sharply defined changes in their physical properties with changes in temperature, they must be assigned a ranged index for each

characteristic. The use of arbitrary, comparative test results is subject to many pitfalls unless test conditions are very accurately defined. Even with the benefit of accurately defined data, faulty conclusions can be derived. The following discussion and data illustrate the problem.

Thermal Resistance

The highest temperature that a transparent plastic will withstand for relatively short periods of time without visibly degrading may be called its thermal stability temperature (T.S.T.). There is no such single temperature except for a defined condition of heating for a defined period of time. Furthermore, there seldom is any relationship between other properties, indices, and the T. S. T. (For example, in Fig. 1, the modified linear acrylic polymer has a higher heat distortion temperature than the heat-resistant grade of methyl methacrylate polymer.)

The primary interest in the T.S.T. of a material is created by the heating requirements for parts fabrication. It is fortunate that the materials are somewhat "self-inspecting" with respect to excessive heating in this temperature range. However, simple visible inspection should not be taken as the final criterion of properties changes. This can be shown by a comparison of the effect of heating at high fabrication temperatures on the flexural strength of an ordinary methyl methacrylate polymer and one meeting MIL-P-5425A (heat-resistant) standards (Figs. 2 and 3).

We suggest that the T.S.T. of materials be determined by heating in rapidly moving air. The use of air duplicates most heating-for-forming practices, takes into account atmos-

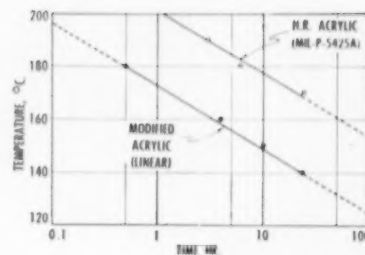


Fig. 1—Visible thermal degradation

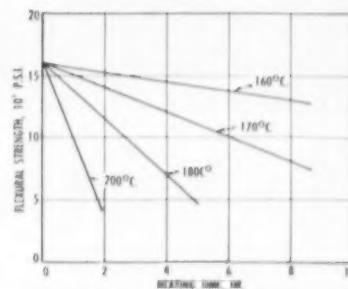


Fig. 2—Effect of high-temperature heating on methyl methacrylate polymer

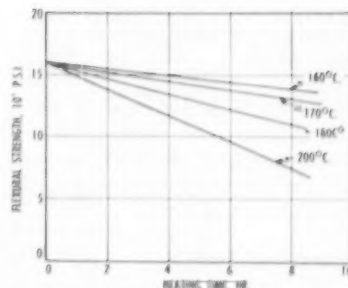


Fig. 3—Effect of high-temperature heating on MIL-P-5425A acrylic

pheric oxygen degrading effects, and avoids the problem of deciding upon an acceptable liquid heat transfer medium. Degradation should be judged by close visual examination

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† Chief Physicist, Rohm & Haas Co.

This paper was presented at AIA-WADC Conference on Transparent Materials, Dayton, Ohio, March 1955.

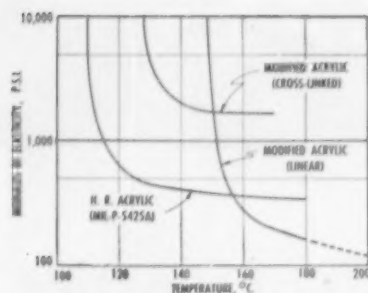


Fig. 4—High-temperature tensile modulus (measured 30 sec. after loading)

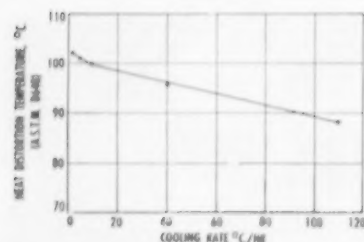


Fig. 5—Effect of cooling rate on heat distortion temperature of 5425A acrylic

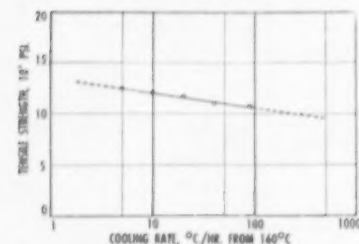


Fig. 6—Effect of rate of cooling from 160°C on tensile strength of Plexiglas 55

and confirmed by measurement of weight loss and some sensitive physical property such as flexural strength.

It is worthy of note that the future may require, in addition to the measurement of the T.S.T., a study of the effect of high-level ultra-violet and nuclear irradiation.

Dimensional Stability

At a temperature somewhat lower than their T.S.T., transparent organic plastics tend to lose dimensional stability. At one time, this was partly a problem of volumetric shrinkage due to plasticizer loss or continuing polymerization (or cure). With improvement in materials it has become mostly a problem of "softening."

The "softening temperature" characteristics of material in the "forming temperature" range are best measured by applying a stress, quickly measuring the strain, and computing a modulus of elasticity. Such data (Fig. 4) are valuable in that they indicate the forces required for forming as well as a working temperature range. We suggest that the satisfactory forming temperature (S.F.T.) of a transparent plastic be defined as that temperature at which the 30-sec. tensile modulus no longer decreases significantly with temperature increase, provided that the S.F.T. be at least 20 degrees C. below the T.S.T.

The difficulty of determining the "softening temperature" of plastics in the structural stress-strain region can be overcome by measuring the strain in a specimen under stress while its temperature is slowly increased. When test conditions are well defined, as they are in A.S.T.M. method D 648 and Federal Specification L-P-406B, method 2011, reproducible results can be obtained on duplicate specimens. A comparison of heat distortion temperatures (H.D.T.), particularly between different materials, requires recognition of the importance not only of test method details but also of specimen history. The effects of moisture content conditioning are widely recognized. Actually these effects are often secondary to those of previous thermal history. The significance of previous thermal history is illustrated by the variation of A.S.T.M. heat distortion temperature values that can be obtained on MIL-P-5425A acrylic by merely changing the rate of cooling of the sheet or test specimen from a heat treatment of 140°C. (Fig. 5). This reversible change of approximately 15 degrees C. is significant (Fig. 6) and permanent (Fig. 7) under ordinary exposure conditions. It has been observed on all of the materials we have studied, generally increasing in magnitude with increasing nominal H.D.T. In view of the magnitude and significance of this cooling-rate effect, we suggest that values of H.D.T. for comparative tabulation be determined on specimens which have been heated to their S.F.T. and cooled at 10 degrees C./hr. to 50° C. An additional value, determined on specimens cooled by removal from the heating oven to

still air at approximately 25° C., would be significant to a study of effect of forming practices on the material.

H.D.T. measurements made at various outer fiber stress values are useful in classifying materials. A comparison of the deformation-versus-temperature curves for a range of 10 to 1000 p.s.i. outer fiber stress will reveal the presence of cross-linked internal molecular structure (Figs. 8 and 9). A plot of H.D.T. (or flexural deformation temperature, F.D.T.) versus applied stress can be used for estimating the relative no-load dimensional stability of parts formed from transparent plastics. Projecting the straightest portion of the curve to a zero load value yields an apparent F.D.T.

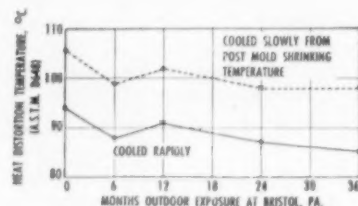


Fig. 7—Effect of outdoor weathering on apparent heat distortion temperature of a methyl methacrylate polymer

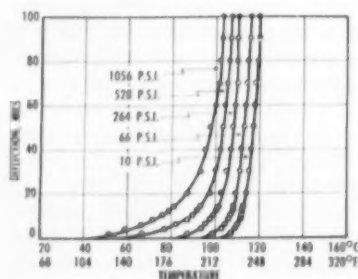


Fig. 8—Flexural deformation temperature of a heat-resistant acrylic

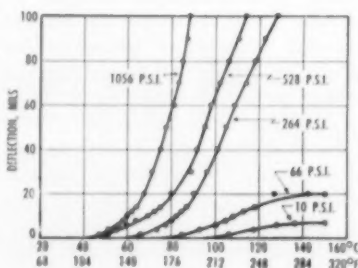
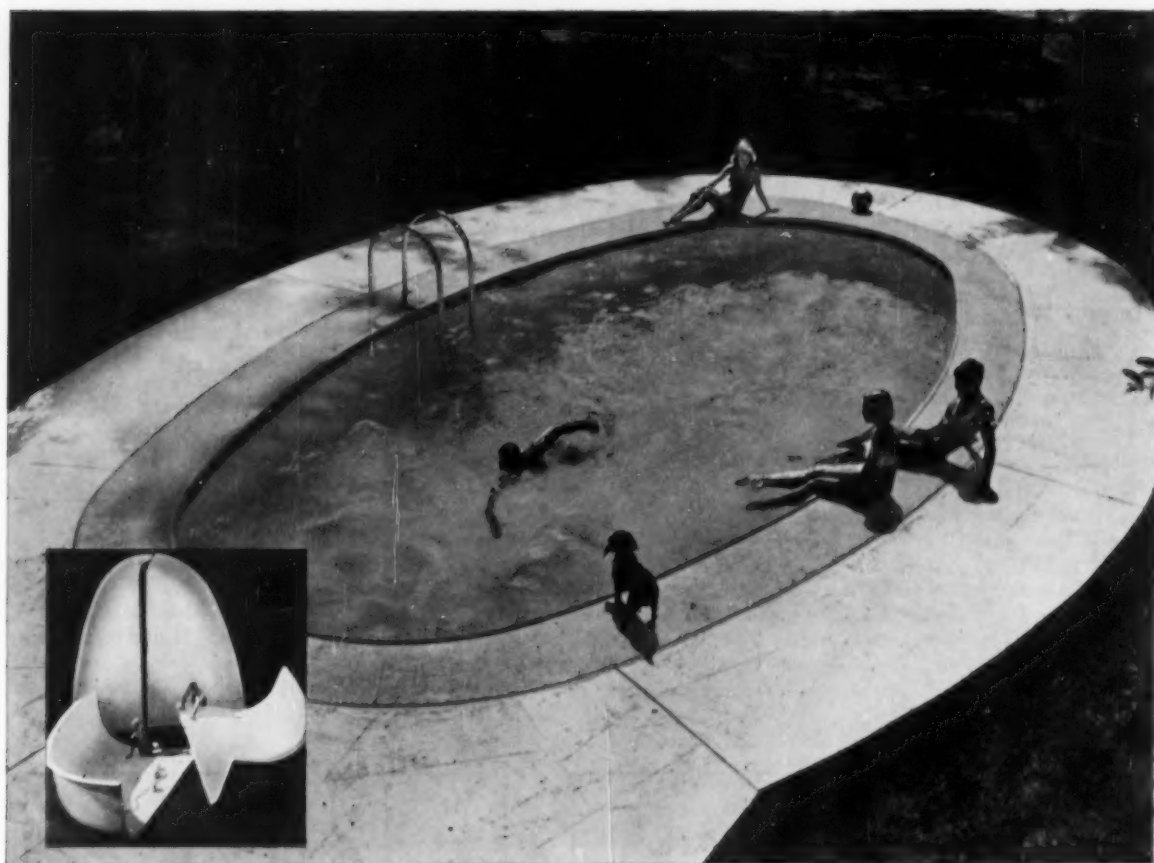


Fig. 9—Flexural deformation temperature of a cast polyester material



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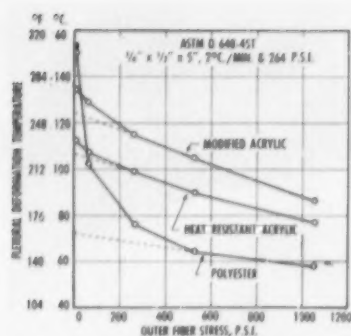


Fig. 10—Effect of stress on flexural deformation temperature of some plastics

(Fig. 10), which is a good index of the maximum temperature a part will withstand without self deformation (Fig. 11).

H.D.T. measurements made at low stress values (we call them F.D.T.'s) are valuable in predicting the stress-strain characteristics of linear polymers. In fact, we find that a

100-mil deflection, 10 p.s.i. F.D.T. measurement can be combined with a room-temperature test result on flexural and tensile strength (or modulus) to quite accurately predict the intermediate temperature values for this type of polymer (Figs. 12, 13, and 14).

An additional dimensional stability consideration has been introduced by the development of stretched acrylic sheet. We evaluate the thermal relaxation temperature (T.R.T.) of stretched materials by measuring the rate with which a 1- by 1-in. specimen decreases in dimension when slowly heated or held at some constant elevated temperature (Fig. 15, p. 156). Results of this type of test are complicated by the characteristics of the base material, the degree of stretch, the stretching conditions, and the post-stretching treatment of the material. They are useful, however, for determining total percent stretch and gross variations in stretching condi-

tions. We hope to be able to combine them with observations of birefringence to obtain good estimates of the quality of stretched acrylic sheet and parts.

The above discussed high temperature characterisitics (namely, the T.S.T., S.F.T., H.D.T., F.D.T., and T.R.T.) are primarily of interest and value in comparing materials. Another characteristic, the satisfactory service temperature (S.S.T.), is most useful to the aircraft glazing designer.

All organic plastics display a complex strain-versus-time of stressing relationship. The initial elastic deformation is followed by a creep deformation which may be, particularly at high temperatures, the largest amount of the total (Fig. 16, p. 156). Also, their stress-strain relationship deviates widely from a convenient mathematical type (Fig. 17, p. 156). Since all the transparent plastics display low values (from about 200,000 to 1,000,000 p.s.i.) of

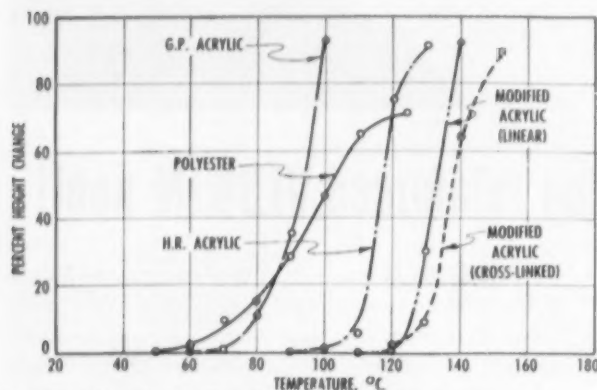


Fig. 11—Thermal relaxation of 8-in. diameter domes, cumulatively heated for 24 hr. in 10° C. steps from 50° C.

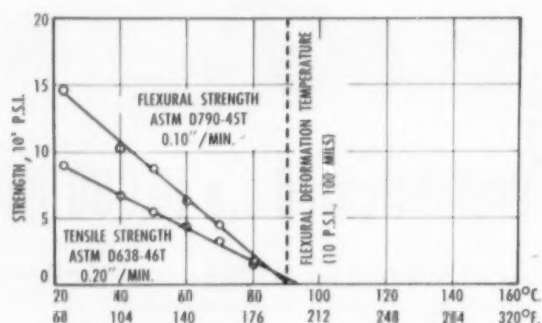


Fig. 12—Graph representing the correlation that exists between strength characteristics and flexural deformation temperature for a general-purpose acrylic material. Test was performed in accordance with ASTM D 638-46T and D 790-45T

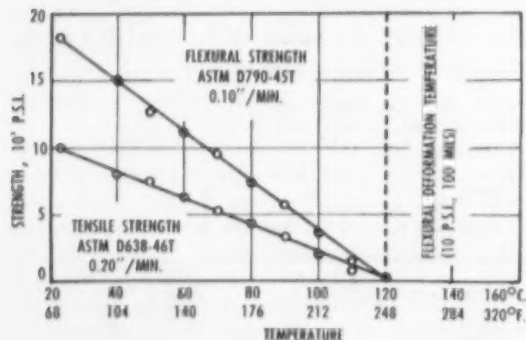


Fig. 13—Correlation between strength characteristics and flexural deformation temperature for a heat-resistant acrylic

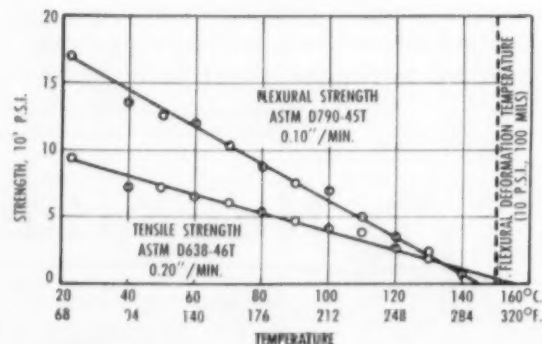


Fig. 14—Correlation between strength characteristics and flexural deformation temperature for a modified acrylic

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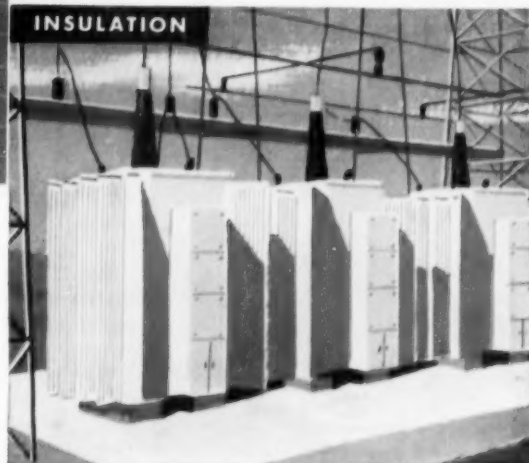


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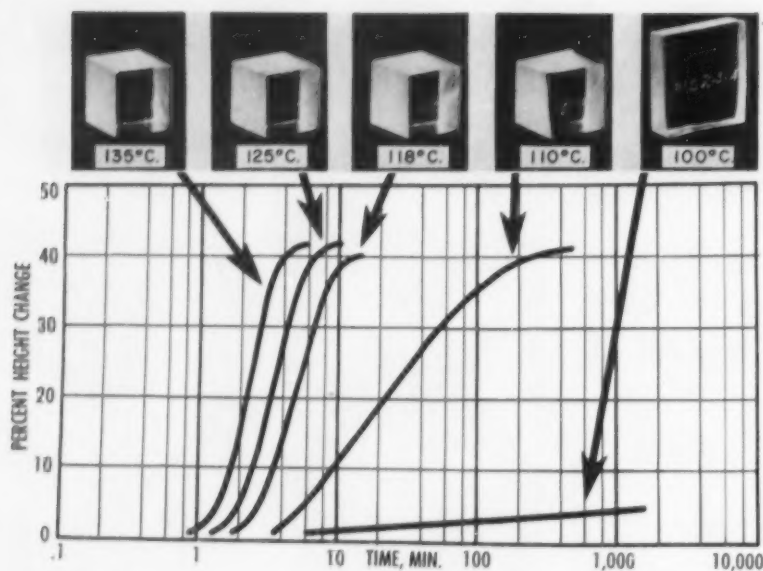


Fig. 15—Curves showing rate of thermal relaxation for biaxially stretched (75 by 75%) heat-resistant acrylic material, meeting Military Specification MIL-P-5425A

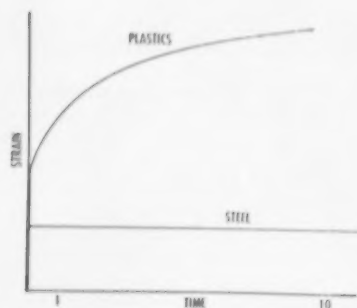


Fig. 16—Strain versus time of strain relationship of plastics and steel

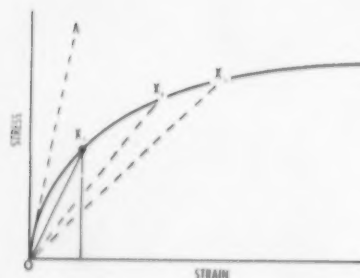


Fig. 17—General stress-strain curve of acrylic polymer material

moduli of elasticity, it is this factor that most frequently influences structural design. Unfortunately, it is difficult to choose a characteristic value for the modulus because of the interactions of time and tempera-

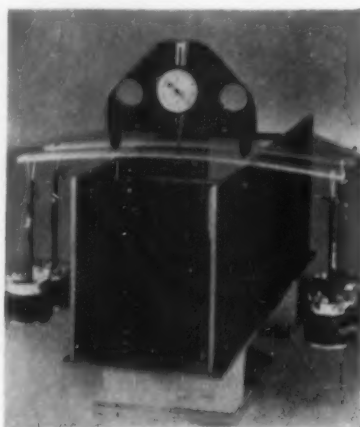


Fig. 18—Apparatus used to measure the apparent modulus of flexure

ture in dictating the stress-strain curve. To overcome this difficulty we have proposed the use of an apparent value that incorporates these factors.

We find it quite easy to measure the apparent modulus in flexure using a four-point loaded beam (Fig. 18). The data obtained from this type of test (and confirmed by the more tedious tensile type of test) plot as straight lines on log-log coordinates (Fig. 19). Cyclic loading also can be easily evaluated by this method (Fig. 20). Such data permit a quick multiple choice of satisfactory service temperature given a

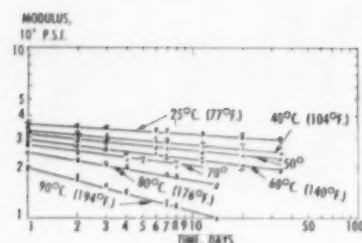


Fig. 19—Log-log plot of flexural modulus of elasticity vs. time of clear MIL-P-5425A acrylic at various temperatures

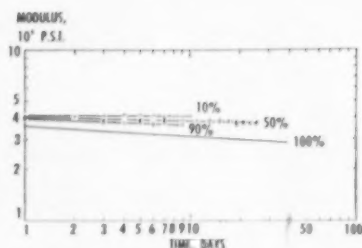


Fig. 20—Log-log plot of flexural modulus of elasticity versus time of clear MIL-P-5425A acrylic at 25°C. Percentage figures on graph refer to percentage of total elapsed time that load (stress) was applied during each cycle period

permissible modulus value and known loading time. We suggest that the satisfactory service temperature be determined for a flexural modulus value of 100,000 p.s.i. at 100 days continuous loading.

Estimation of Service Requirements

The selection of a transparent plastic for use in high-speed aircraft must be guided by a choice of balanced properties combined with an estimation of the stresses that may be applied while the plastic material is being subjected to a surface-to-surface temperature differential.

Due to the scarcity of data on surface-to-surface temperature differentials in high-speed flight, we have made an attempt to simulate such conditions in our laboratory. A simple test unit was constructed to flow hot oil at controlled temperatures across one surface of a panel while air at a controlled temperature was blown across the other. (Fig. 21, p. 242). Hot oil was used to approximate, in a controllable manner, the heat transfer characteristics of high-speed air (To page 242)

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|------------|--------|
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| @ 50.0° C. | 17.9 |
| @ 60.0° C. | 7.8 |
| @ 75.0° C. | 1.7 |

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|--------|-----------|
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| Failed | -30.0° F. |

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|------------------|-----|
| 60 days @ 97° C. | 85% |
|------------------|-----|

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** Based on current list prices of raw materials

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Polyamides Based on ϵ -Caprolactam

by J. F. KOHLWEY* and C. MATERS*

AMONG the various polyamides there are two that have become prominent, nylon-66 and nylon-6. Both find their main use as yarns and fibers, but their applications as plastic molding materials are also rapidly growing. As compared to other polyamides, nylons-66 and -6 are lower in price and the expected

* Algemene Kunstzijde Unie N.V., Arnhem, Holland

further improvement in economy of their manufacture justifies special attention to the development of their various applications.

The development of polyamide applications in the United States has been mainly based on nylon-66, whereas on the European continent nylon -6 has been given more attention in view of the availability of the

monomer, ϵ -caprolactam. However, ϵ -caprolactam polymer is now becoming available in larger quantities in the United States. Consequently, American industry may be interested in the writers' experiences in developing uses for Akulon, a nylon-6, manufactured by Algemene Kunstzijde Unie N.V.

Nylon-66 is basically a polymer of

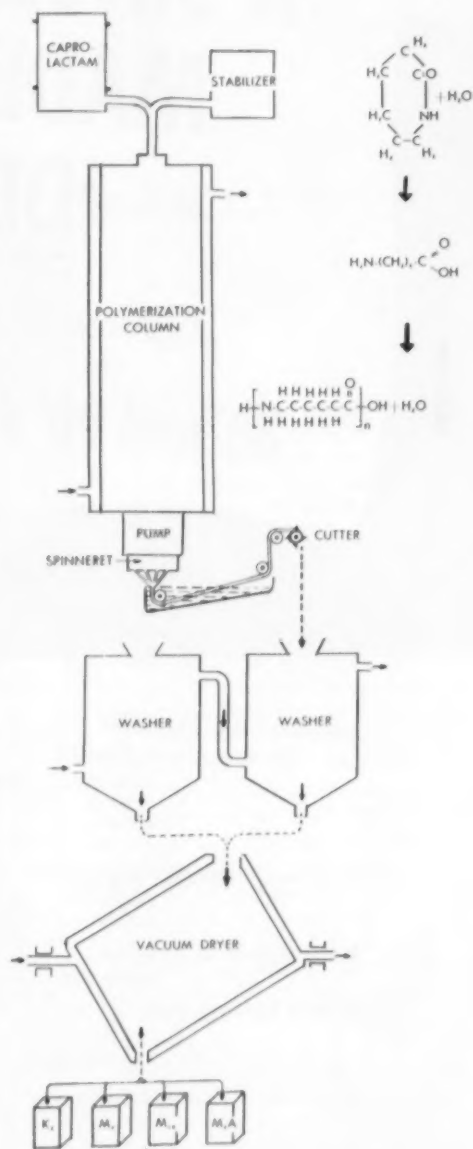
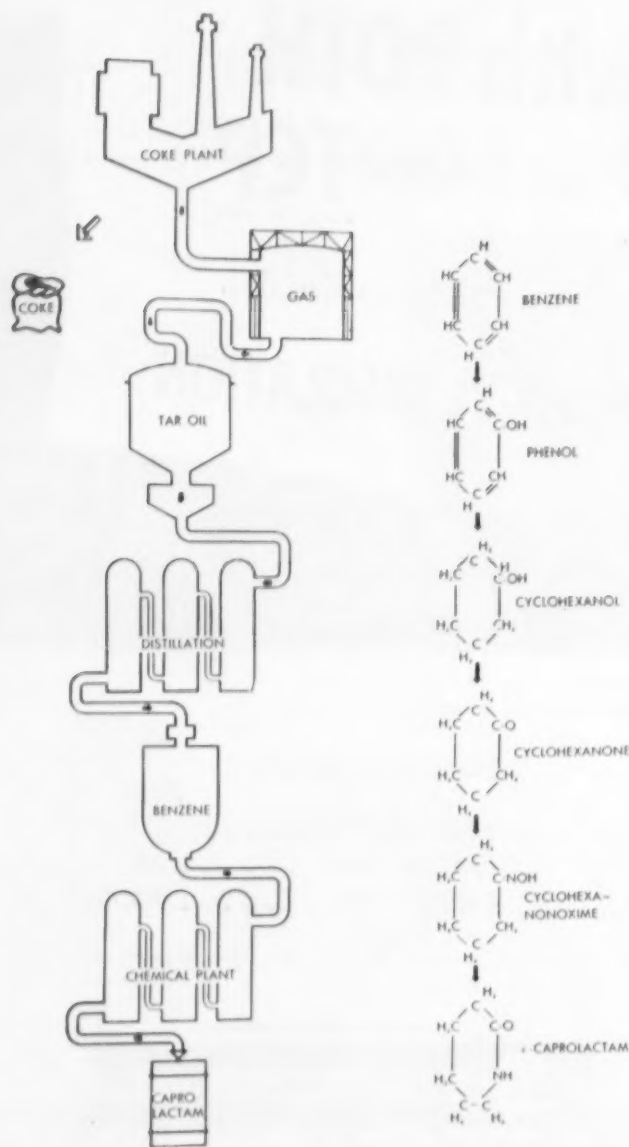
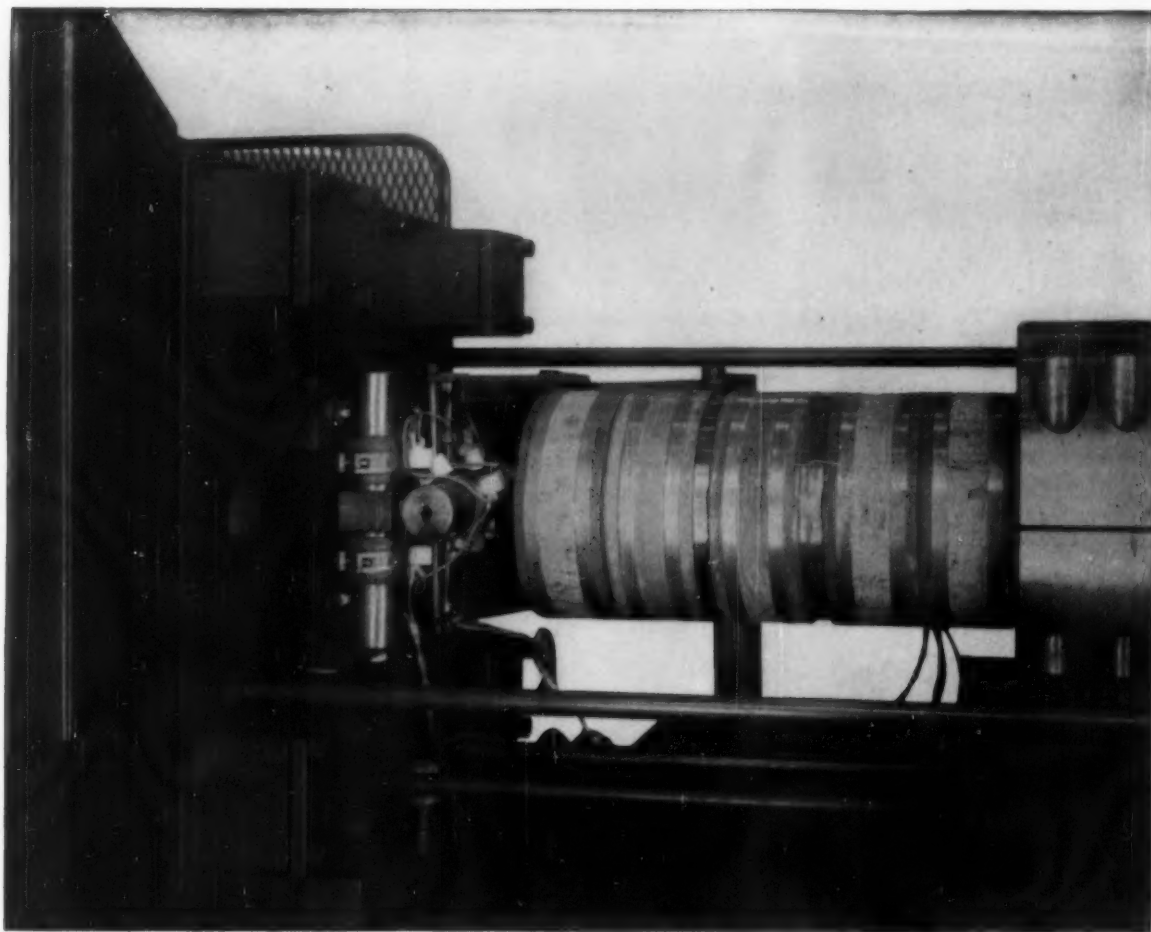


Fig. 1 (left)—Flow chart of production of caprolactam polymer. Fig. 2 (right)—Flow chart of production of molding compound from caprolactam



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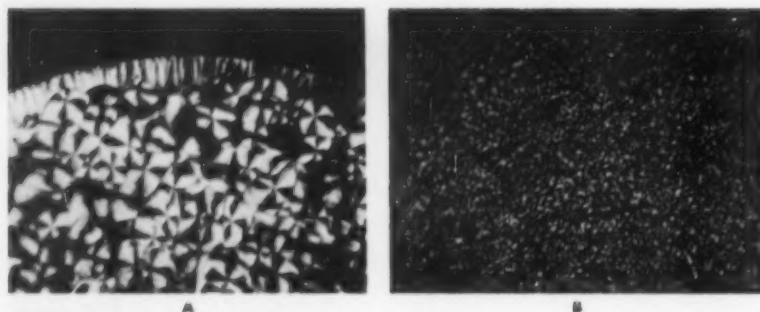


Fig. 3—Differences in crystallization behavior of normal nylon-6 (A) and a special grade of Akulon (B) after prolonged heating in an atmosphere of high humidity



All illustrations with this article courtesy Algemene Kunstzijde Unie, N.V.

Fig. 4—Articles injection molded of nylon-6 for medical use; some are transparent

two compounds, each containing a chain of 6 carbon atoms (hence the name nylon-66), namely, adipic acid and hexamethylenediamine. Nylon-6 is a polymer of only one compound with a chain of 6 carbon atoms (hence the name nylon-6), namely, aminocaproic acid. The aminocaproic acid is not used as such, but as the lactam (ϵ -caprolactam). On heating in the presence of water, this lactam yields aminocaproic acid, which in turn undergoes the polycondensation reaction to form the polyamide.

It is not necessary to discuss the various manufacturing processes of ϵ -caprolactam beyond pointing out that there is a "classical" method (Fig. 1, 158), which is mainly used, and also certain newer methods. In recent years both have undergone further developments which hold promise for cost reductions in the future.

Figure 2, p. 158, shows a simplified diagram of the production of the molding compound in the form of

uniform cylindrical granules. This particular process is based on continuous polymerization in a column. If properly controlled, this continuous polymerization has the advantage over batch processes of yielding very uniform products.

As is generally known, the polymerization normally reaches an equilibrium. This equilibrium is characterized by the presence of about 10% of a fraction of lower molecular compounds, among which is also monomer. These lower molecular constituents, when left in the product, exert a plasticizing effect. Often, however, they are removed, making use of the fact that they are soluble in hot water. The resulting molding compound thus becomes more rigid.

The above explains the fact that there are two distinct types of nylon-6, a relatively soft one and a more rigid grade. The more rigid product is by far the most important.

In the process shown on the flow chart (Fig. 2) the lower molecular

fractions are washed out. However, there are also other methods of achieving a product more or less free of lower molecular fractions. One such method involves, for instance, a vacuum treatment during or immediately after the polymerization process.

Properties

The general properties of polyamides (abrasion resistance, toughness, strength, etc.) are well known and need not be discussed further. For the purpose of this article it is sufficient to indicate the main differences between nylon-6 and nylon-66.

First, there is the difference of melting point: nylon-66 melts at about 500° F., whereas nylon-6 in general melts at about 420° F. Then there is a certain difference in hardness and flexibility: Rockwell hardness R for nylon-6 is 90 and for nylon-66 is 110. Moreover, there can be a difference in tensile modulus of elasticity (87,000 for nylon-6 and 200,000 for nylon-66). These differences can, if necessary, be largely compensated for by selecting molding conditions for the nylon-6 that increase the length of time the formed article is exposed to temperatures at which crystallization takes place (around 340° F.). Slower cooling speed in the mold or even simple heat treatment afterwards can produce more rigidity



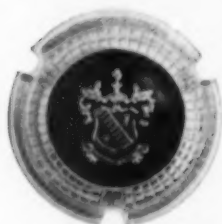
Fig. 5—Handle for fishing rod is injection molded of nylon-6 material



Air Conditioner Panel



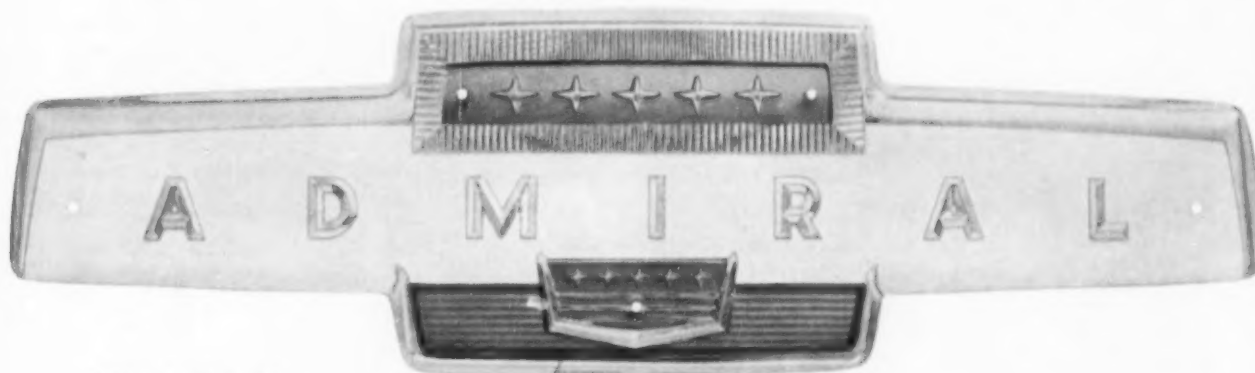
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Fig. 6—Oil can has several components injection molded of caprolactam nylon



Fig. 8—Various articles fabricated of extruded nylon-6 material

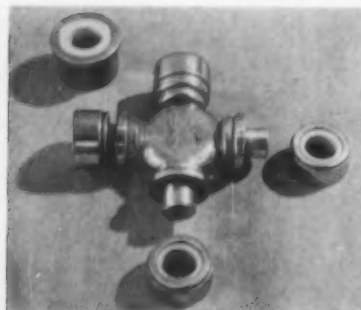


Fig. 9—Bushings of automobile universal joint are fabricated nylon extrusions

than obtained by normal molding of nylon-66.

The ultimate moisture absorption of nylons-6 and -66 is about the same, although nylon-6 absorbs moisture somewhat faster.

Recrystallization processes that in the long run cause embrittlement may under certain conditions take place in polyamide articles. This recrystallization is favored by continuous exposure to temperatures above 250° F. It also can take place at even lower temperatures when combined with sunlight and high humidity, such as in tropical climates. This recrystallization tendency is some-

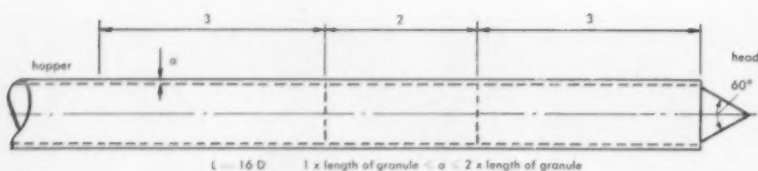


Fig. 7—Special design of screw for extrusion of nylon-6

what less pronounced in nylon-6 and special grades of nylon-6, practically free from this tendency, can be produced. The difference in behavior of normal nylon-6 and the special grade of Akulon referred to above upon heating one week in saturated steam at 250° F., is illustrated in Fig. 3. Figure 3A shows the development of relatively large spherical crystals and Fig. 3B shows an unchanged relatively fine and homogeneous crystal structure. Practical tests have also proved that complicated molded articles based on nylon-6 corresponding to Fig. 3B show considerably less tendency towards internal stresses.

On the whole, one finds that there is more variation in grades on the market of nylon-6 than of nylon-66, indicating a greater versatility of the nylon-6. Manufacturers have been able to modify certain properties during the manufacturing process. Variations exist, for instance, in viscosity, plasticizing zone, flexibility, and also in stability against light and oxidation. Hence, there are special grades for injection molding, extrusion, and other processes.

Injection Molding

Injection molding of nylon-6 is now a standard procedure. Initial difficulties, such as mold-sticking, have been overcome by adding suitable lubricants.

Thin-walled articles that are practically transparent can be made of nylon-6. The articles shown in Fig. 4, mainly for medical purposes, are quite transparent. Typical examples of other articles made by injection molding are shown in Fig. 5, p. 160, and Fig. 6, above.

Extrusion

Though extrusion of nylon-6 on a normal screw for nylon-66 does not offer special problems, a design specially adapted to nylon-6 is an advantage. A typical screw designed for nylon-6 is shown in Fig. 7. This special design takes into account

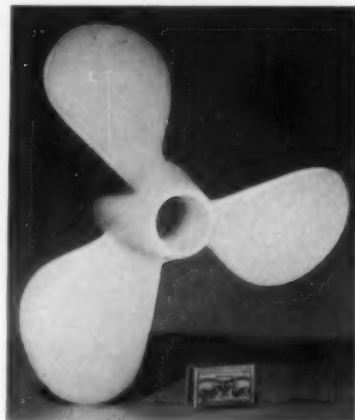


Fig. 10—Propeller screw for small ship produced of nylon-6 by an extrusion molding operation in Denmark by Dansk Termoplastisk Industri

that nylon-6 has a somewhat longer plasticizing range. Consequently in practice, by the use of this specially designed screw and by maintaining the temperature within certain limits, a close tolerance and regularity in the extruded profile can be achieved. The fact that nylon-6 shows

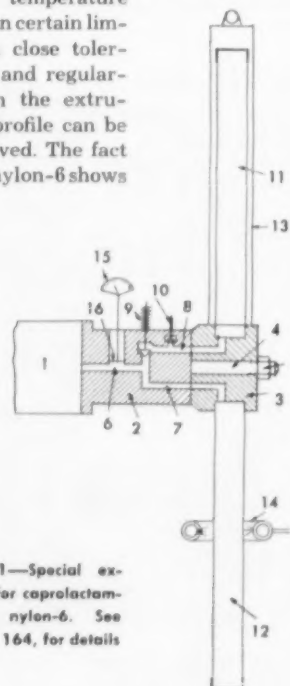


Fig. 11—Special extruder for caprolactam-based nylon-6. See text, p. 164, for details

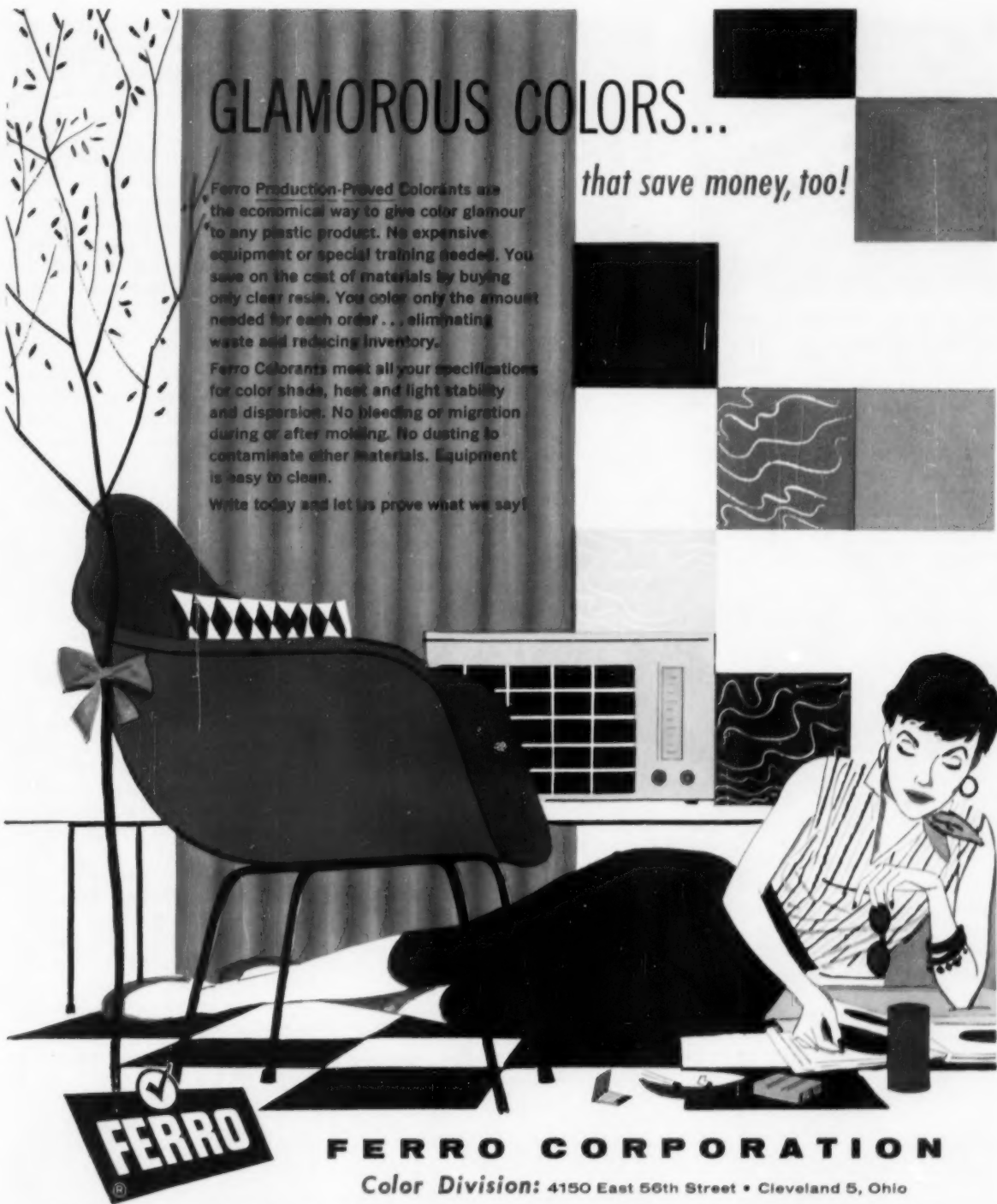
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Fig. 12—Variety of articles punched or deep-drawn from nylon-6 sheet

a less sudden shrinkage and a somewhat more gradual solidification, as compared to nylon-66, facilitates its general use for extrusion and is responsible for the fact that extrusion is developing into a major outlet for nylon-6. Examples of extrusions are shown in Figs. 8 and 9, p. 162.

Nylon-6 also offers interesting possibilities for special molding techniques in extrusion molding and centrifugal casting. As the higher viscosity enables a considerable building-up of pressure, the extruder in combination with a flow-pressure system can advantageously be used for an extrusion molding operation. In this way small numbers of big articles can be molded (Fig. 10, p. 162).

U.S. Patent 2,697,854 (Boasson and Voigt) gives an example of a special machine (Fig. 11, p. 162) for extrusion molding of nylon-6. The end of the extruder (1) is connected to the feeding device (2). In line with the extruder is the revolving head (3), which rotates round the



Fig. 13—Blown nylon bottles

axis (4). A locking member (5) can clamp the revolving head. Within the feeding device is the supply direct (6) which branches into two channels (7) and (8). The latter forms an overflow with an overflow valve (9) and a safety valve (10). The supply direct passes the molten material to the mold (11). Simultaneously, the already filled mold (12) is cooling. The diagram shows a heating device (13) around the mold that is being filled, and a cooling device (14) around the mold already filled. Pressure control is maintained by the spring tension of the overflow valve (9), and is calibrated by the diaphragm (16) connected to the indicator (15). The arrangement permits continuous molding cycles.

Films are made either by simple extrusion or by a blowing system. In general, film thicknesses of 0.01 in. are made by layflat tubing,

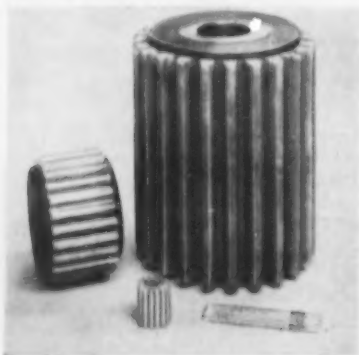


Fig. 14—Nylon gear wheel with steel inserts made by centrifugal casting



Fig. 15—Nylon bushing for propeller shaft made by centrifugal casting

thicker foil by straight extrusion. Uses for this foil are now being developed, both for packaging and technical purposes. Outstanding properties are heat resistance, resistance against solvents, and great strength. Although moisture permeability is greater than for polyethylene, the permeability for aromas and flavors is practically nil. Articles punched or drawn from sheet stock are shown in Fig. 12. Several examples of blown bottles are shown in Fig. 13.

Centrifugal Casting

This method of forming articles from nylon-6 has been developed mainly in Holland. It is used to produce small numbers of large articles. Very large pieces can be made; a typical application has been the fabrication of a piston ring 4 ft. in diameter and weighing 70 pounds. Other products made by centrifugal casting are shown in Figs. 14, 15, and 16.

Centrifugal casting in its simplest form is done by putting a weighed amount of polyamide granules in a revolving horizontal tube heated with the aid of gas burners. Better quality products are obtained by pouring molten material into vertical revolving tubular molds. Melting is usually done with the aid of an extruder. For best results, heating and cooling cycles must be adjusted for each article.

Thus, it can be seen that many European manufacturers are taking full advantage of the special properties of nylon-6. There still remains, however, a vast field for development of the markets open to the wide range of grades in which this form of nylon is available.

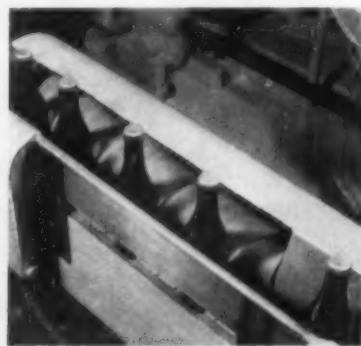


Fig. 16—Nylon conveyor screw for bottling machine is centrifugally cast

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The special 'finned' design of Heating Cylinder gives homogeneous plasticizing at high rates and is 'pre-filled' during the molding closing stroke.

Fig. 1.— FORWARD POSITION. Here the prefiling ring has drawn back clear of the feed and a fresh charge of material passes into the cylinder; the plunger remains forward.

Fig. 2.— BACK POSITION. After the new charge has been drawn in, the prefiling ring travels forward, compressing the material at the same time as the plunger moves back ready for its forward injection stroke. The nozzle is designed to restrict the escape of material during this action.

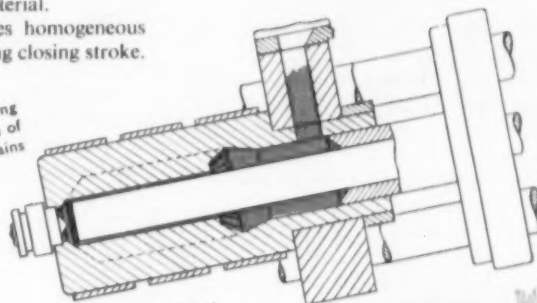


FIG. 1

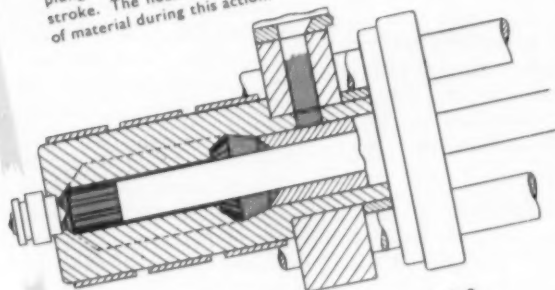


FIG. 2

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| | |
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| Approximate weight of material plasticized per hour (Dependent upon weight per shot and material used)... | 22 lb. |
| Area of Injection plunger ... | 2.074 sq. in. |
| Pressure per square inch on material at end of plunger... | 9,100 lb. |
| Total pressure on Injection plunger ... | 18,850 lb. |
| Mold opens (adjustable) ... | 6-9 in. |
| Maximum die space ... | 7½ in. |
| Minimum die space ... | 3½ in. |
| Maximum recommended casting area in mold ... | 15 sq. in. |
| Size of die plates ... | 16 x 10 in. |

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PLASTICS DIGEST*

Abstracts from the world's literature of interest to those who make or use plastics or plastics products. For complete articles, send requests direct to publishers. List of addresses is at the end of *Plastics Digest*.

General

RECORD YEAR FOR PLASTICS. *Brit. Plastics* 28, 1-3 (Jan. 1955). Of the estimated 240,000 tons of plastics produced in England in 1954, more than half is accounted for by the thermoplastics. The vinyl materials form the biggest group with an estimated production of 60,000 tons, one quarter of which was used for conveyor belting in mines. The production of phenolics was 27,000 tons, polystyrene 22,000 tons, ureas 20,000 tons, and polyethylene 20,000 tons, the latter representing a 70% increase over 1953 production.

LEATHER AT THE CROSSROADS. *Chem. Eng. News* 33, 2494, 2496 (June 13, 1955). Recent developments in the fields of plastics that produce materials that compete successfully with leather and the use of resins in the leather industry are reviewed.

Materials

GLASS-PREMIUM COMPOUNDS FOR MOLDED PARTS. *R. White. Elec. Mfg.* 55, 118-25 (Mar. 1955). Glass-premium molding compounds are made by mixing chopped glass fibers with polyester, melamine, or phenolic resins and various inert fillers. Proportions of the three types of constituents may vary widely. High-filler mixes (over 50% filler) tend to resemble putty when wet and hard clay when dry and compressed or extruded. High-glass mixes (over 20% glass) tend to be loose and resilient. The high-filler mixes are usually less expensive and lower in strength than the high-glass mixes, but they have good dimensional, electrical, and chemical stability. The high-glass mixes are more difficult to handle in molding but give outstanding physical properties. Although molded premium parts are made of the same basic constituents as laminates, some of their properties are different and their molding characteristics are entirely different.

*Reg. U.S. Pat. Off.

Typical successful applications for glass-premium compounds include high-impact stand-off insulators for electric cranes, coil forms in heavy-duty power circuits, brush-holder insulation for diesel locomotive generators, contractor arm insulation in hydraulic pump drive motors of 300 to 3000 hp., motor-cooling fan blades, and blow-out support for heavy circuit-breakers. Problems arising in processing glass-premium compounds are discussed; these include non-uniform strength properties, uneven resin concentration, warping, internal voids, cracks around molded openings, surface ripple marks, and a tendency to incipient cracking under impact. Tables of selection factors involved for the applications discussed are given.

HYDROXYETHYL NYLON, A NEW FLEXIBLE SUPERPOLYAMIDE DERIVATIVE. *H. C. Haas, S. G. Cohen, A. C. Oglesby, and E. R. Karlin. J. Polymer Sci.* 15, 427-46 (Feb. 1955). Interesting new derivatives of nylon with unusual properties were prepared by treating nylon with ethylene oxide. These graft copolymers have greatly enhanced flexibility but still retain the high melting character of the original nylon. A hydroxyethyl 6-6 nylon containing 50% combined ethylene oxide was found to be flexible and useful over a very large temperature range, the polymer having a melting point of 221°C. and an apparent second-order transition point below -40°C. Analyses made to study the distribution of combined ethylene oxide residues in these materials indicated a tendency toward limited substitution of the nylon backbone and rather long average polyethylene glycol branch lengths.

A SPORTING APPROACH TO STRONG PLASTICS. *J. W. Case. SPE J.* 11, 24-26, 32-34, 54 (Jan. 1955). Some of the essential properties of reinforced plastics and factors involved

in attaining these properties are discussed by a comparison with laminated archery bows. These properties are high strength, flexibility, and toughness. The importance of equal loading of glass fibers in a reinforced plastic is discussed. The type of glass fiber and bonding system necessary to improve the strength properties of glass reinforced laminates were investigated, using the above analysis as a basis. A parallel-type glass fiber mat laminate had significantly higher strength properties than those made with commercial glass fabric.

A NEW CLASS OF OLEFINIC POLYMERS HAVING AN EXCEPTIONAL REGULARITY OF STRUCTURE. *J. Polymer Sci.* 16, 143-54 (Apr. 1955). The exceptional properties of a new class of linear polymeric hydrocarbons, obtained by the polymerization of α -olefins, are described. The high melting points, the high degree of crystallinity, the low solubility, and the special mechanical properties of these polymers are attributed to a particular regularity of structure, due to the existence, in each macromolecule, of a long sequence of asymmetric carbon atoms, all having the same steric configuration. It is suggested that this special type of order of asymmetric carbon atoms in linear macromolecules be called "isotactical."

Molding and Fabricating

A NEW APPLICATION OF DIELECTRIC HEATING. *A. Blake. Plastics (London)* 20, 31 (Jan. 1955). The use of dielectric heating to gel a plasticized polyvinyl chloride roller is described. The polyvinyl chloride paste can be gelled in two minutes by dielectric heating compared to 60 min. in an oven at 160°C.

A NEW COMPRESSION MOLDING PROCESS FOR PRINTED CAPACITORS. *E. M. Davies, R. S. Marty, and P. J. Franklin. Elec. Mfg.* 55, 100-107 (Feb. 1955). A new compression molding technique for producing printed capacitors is described. Dielectric films composed of a powdered, high-dielectric-constant ceramic and a resin binder are pressed onto a ceramic base plate and heat-cured. The ceramics used in formulating the dielectric are mixtures of alkaline earth titanates and zirconates with small additions of some inorganic oxides. The best results

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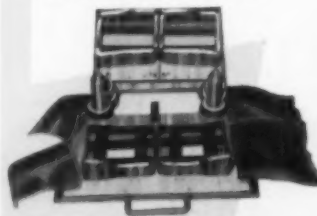
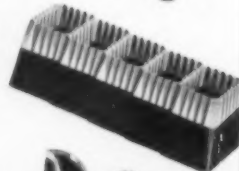


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PRODUCTION OF POROUS FILM AND SHEET. Brit. Plastics 28, 14-15 (Jan. 1955). A device for producing up to 400 pores per sq. in. in plastic film and sheet is described. The device consists essentially of a metallic cylinder holding as many as 400 needles per sq. in. which perforate the sheet. The process results in increased air and moisture permeability without affecting many characteristics, such as tensile strength, substantially.

SPECIFICATIONS FOR USE UNDER STATISTICAL QUALITY CONTROL. D. Shainin. SPE J. 11, 13-15, 50, 52 (Jan. 1955). Statistical quality control can make available to producers and consumers more facts, to replace previous opinions, which bear on all phases of getting workable specifications. Statistical quality control can provide information as to the natural tolerance of a process, the factors contributing to the variability, the effects of the variability on service use, and other similar questions.

Applications

DEVELOPMENTS WITH THE NYLON SYRINGE. Plastics (London) 20, 17 (Jan. 1955). A new grade of nylon is used in the injection molding of hypodermic syringes that can be sterilized at temperatures up to 120° C. Two major problems encountered were molding so that the barrels could be interchanged following sterilization, and the provision of volume markings.

INDUSTRIAL APPLICATIONS OF NYLON. Plastics (London) 20, 52-54 (Feb. 1955). Applications of molded and fabricated nylon in the brewing, electrical, and textile industries are described. In the brewing industry, molded nylon is used for conveyor belts, pipe unions, hop strainer, and

partitions for protective packaging



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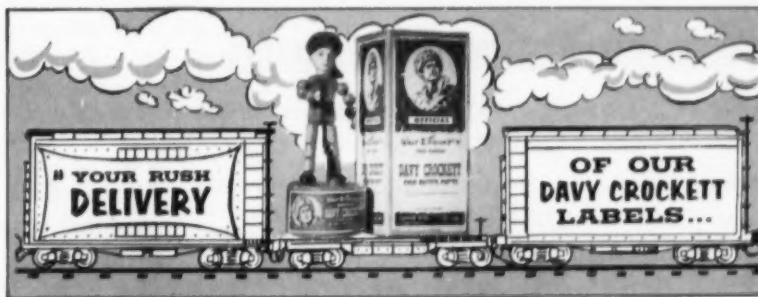
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Properties

ELECTRICAL AND CHEMICAL EFFECTS OF β -RADIATION IN POLYSTYRENE. P. Y. Feng and J. W. Kennedy. *J. Am. Chem. Soc.* 77, 847-51 (Feb. 20, 1955). The electrical conductivity of dielectrics under β -irradiation is considered to be due principally to the radiation-produced ion pairs. By assuming the ion pairs are formed at a rate proportional to the rate of energy dissipation in the dielectric and that they recombine according to second order kinetics, a relation is derived between source intensity, dielectric thickness, and limiting voltage. The electrical conductivity of polystyrene, polyethylene, and Teflon under β -irradiation was studied by measurement of the limiting potential generated by the passage of β -particles through the solid dielectric. The limiting voltage obtained is directly related to the con-

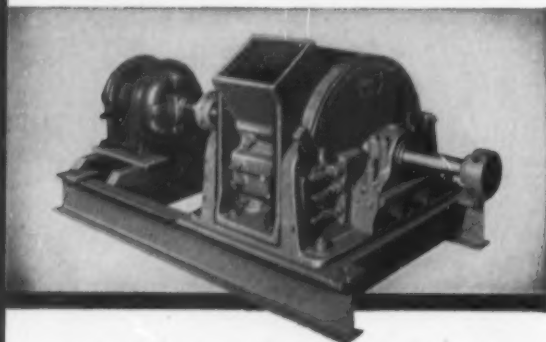
ductivity of the system. In the case of polystyrene, irradiation by β -particles caused degradation if air was present but caused further polymerization if air was excluded. Bombardment of polystyrene in a helium atmosphere by deuterons caused extensive cross-linkage. Studies of the radiation chemical effects in polystyrene show that the rate of polymerization depends on the square root of the radiation intensity. In the presence of air the rate of degradation varies with something between the square root and the first power of the radiation intensity.

VISCOELASTICITY OF POLYMETHYL METHACRYLATE—AN EXPERIMENTAL AND ANALYTICAL STUDY. J. K. Knowles and A. G. H. Dietz. *Trans. ASME* 77, 177-186 (Feb. 1955). Static tensile stress-strain data are presented for several types of polymethyl methacrylate tested under many different experimental conditions. An empirical equation fits the early portions of the stress-strain curves under the various testing conditions and structural characteristics.

A mathematical analysis attempts to correlate the static behavioral characteristics of two varieties of methacrylate by means of an extension of the Boltzmann-Volterra theory of the elastic after-effect, to an extent that facilitates the prediction of creep and constant-strain-rate curves from stress-relaxation data with a precision acceptable for engineering purposes.

MELTING POINTS OF CHAIN POLYMERS. C. W. Bunn. *J. Polymer Sci.* 16, 323-43 (Apr. 1955). The molecular characteristics that determine the melting points of high polymer crystals are considered. It is shown that the properties of monomeric crystals often throw light on those of the polymers. The principal factors controlling melting points appear to be molar cohesion energy, molecular flexibility, and molecular shape effects. Figures for the cohesion energy increments of a number of chain units and substituent groups are given, and melting points of polymer series are correlated with cohesion energy per chain unit. The flexibility factor is less easy to as-

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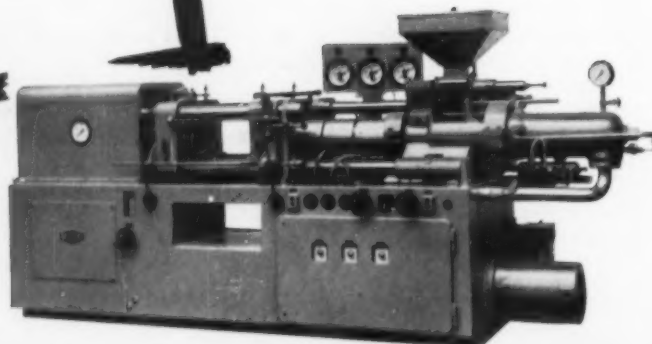
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sess; barriers to rotation in appropriate monomer molecules are relevant, but available data are very rough. The approach, therefore, is mainly by empirical and comparative methods. When plotted against cohesion energy per chain unit, the melting points of various series of aromatic polyesters and polyurethanes fall within the same band, while those of the polyamides lie, on the whole, higher and those of the aliphatic polyesters, polyethers, polythioethers, and polydisulfides much lower. The differences are attributed to difference of molecular flexibility arising from the presence of easily rotating O—C, S—C and S—S bonds. The low melting points of rubber and other unsaturated polymers are attributed to the fact that rotation round single bonds that are adjacent to double C=C bonds is easier than in saturated chains. Easily rotating bonds that are inclined to each other, as in cis isomers, confer greater chain flexibility than the parallel bonds in trans isomers, and thus lead to lower melting points. The marked odd-even effects in saturated molecules which run through the whole of organic chemistry (the even members always melting higher than the odd) are attributed to similar effects arising from the fact that the end bonds of an odd CH₂ sequence are inclined to each other while those located at the ends of an even sequence are arranged in parallel.

Testing

DETERMINATION OF THE DEGREE OF CURE OF POLYESTER RESINS. B. Parkyn. Brit. Plastics 28, 23-25, 39 (Jan. 1955). The term "cure" refers to degree of cross-linking in a polyester resin. Incomplete molecular cross-linking is referred to as "undercure." There are two types of undercure: temporary, in which chemical changes are still taking place so that full curing results; and permanent, in which the polymerization reaction has finished and the undercure cannot be rectified. An undercured laminate has inferior weathering properties and water resistance, poor dielectric properties and poor chemical resistance. The four main causes of undercuring in a polyester laminate are: the nature of the resin, such as the incorrect amount of styrene; the nature of the glass cloth or mat, where the most common

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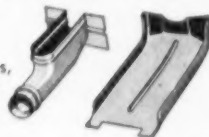
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cause is moisture; the type and quantity of catalyst and accelerator; and, laminating technique, where the most important cause is low temperature. Unfortunately, there is still no good method available for measuring degree of cure of polyester laminates.

Chemistry

ACID ACCELERATION OF EPOXIDE CONDENSATIONS. E. C. Dearborn, R. M. Fuoss, and A. F. White. *J. Polymer Sci.* 16, 201-208 (Apr. 1955). The addition of carboxylic acid to Epon 834-phthalic anhydride resins accelerates the rate of cure. The maximum thermal yield point corresponds to reaction of all the epoxide groups in the ratio of two anhydride carbonyls to one epoxide oxygen or of one acid carbonyl to one epoxide oxygen. The initial presence of some secondary alcohol groups appears to be essential for initiation of reaction. Carboxylic acids react directly with epoxide groups to produce secondary alcohols which in turn react with phthalic anhydride, regenerating carboxylic acid groups. Succinic acid

gives a rapid cure, although not as fast as amines, to a resin with only slightly lowered thermal yield point, while benzoic acid depresses the yield point by about 15 degrees because it tends to function as a chain-stopper.

POLYVINYLPIRIDINE EMULSIFIERS FOR POLYMERIZATION IN ACIDIC MEDIA. J. E. Pritchard, M. H. Opheim, and P. H. Moyer. *Ind. Eng. Chem.* 47, 863-866 (Apr. 1955). Polymers and copolymers derived from vinylpyridines serve as useful emulsifiers for polymerizations of styrene, acrylonitrile, butadiene, vinyl chloride, vinyl acetate, and methyl acrylate in acidic media. Polymerization systems based on these polymeric emulsifiers exhibit the superior process control and high rates of reaction inherent in emulsion processes while approaching mass or suspension techniques in capacity to provide polymers that are free of nonpolymeric contaminants. Because of the emulsifying activity of vinylpyridine polymer segments, copolymers of vinylpyridine often may be prepared in self-emulsifying acidic systems without use of preformed

polyvinylpyridine or other emulsifier. Polystyrene prepared with a polymeric emulsifier exhibits a heat distortion temperature (215° F.) 15 to 30 degrees F. above that of typical commercial polystyrenes. Stress-strain properties are good and the molecular weight as indicated by an inherent viscosity of 2.9 is relatively high. Polymeric emulsifiers offer advantages in the emulsion polymerization of acrylonitrile. The polymer is obtained as a fluid latex or in the form of a dispersion, whereas conventional emulsifiers, on the other hand, ordinarily provide only flocculated products.

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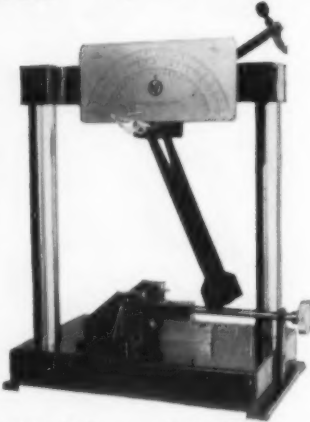
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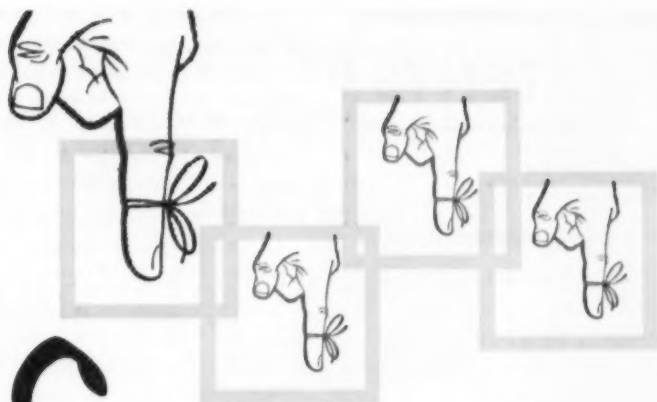
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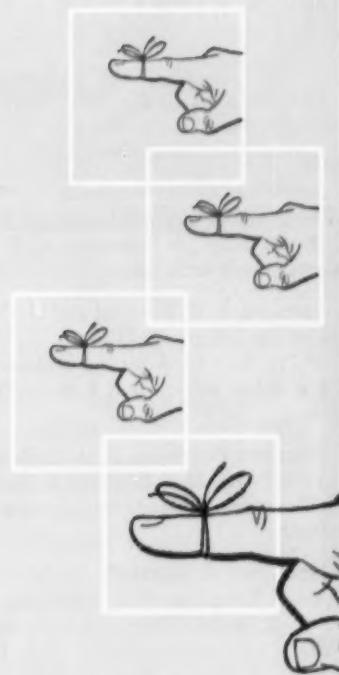
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U. S. PLASTICS PATENTS

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MOLD. G. E. Gard (to Armstrong Cork). U. S. 2,707,801-2, May 10. Mold for dielectric heating and mold with vented liner.

MOLDS. B. F. Thorne (to Telegraph Construction and Maintenance). U. S. 2,707,803, May 10. Molds for thermoplastics.

FILMS. C. P. Smith, E. W. Le-Boenf, and O. R. McIntire (to Dow). U. S. 2,707,805, May 10. Films and fibers.

INSULATOR. M. S. Greenhalgh and S. C. Martens (to General Electric). U. S. 2,708,173, May 10. Polyvinyl chloride insulator.

VINYL RESINS. G. F. Goldstein (to Interchemical). U. S. 2,708,188, May 10. Printing on vinyl plastics.

POLYMERS. R. G. Nelb and C. H. Alexander (to U. S. Rubber). U. S. 2,708,189, May 10. Polymers of dialkenyl imido carbonates.

ADHESIVE. E. O. Joesting and D. O. Ethier (to Minnesota Mining). U. S. 2,708,192, May 10. Adhesive containing a diene rubber and a phenolic resin.

TITANIUM POLYMERS. J. H. Haslam (to Du Pont). U. S. 2,708,203-5, May 10. Polymeric titanium organic compounds.

INSULATOR. S. Kaganoff (to International Telephone and Telegraph). U. S. 2,708,215, May 10. Jacketed cable.

COMMUTATOR. H. G. Dunn (to Hoover). U. S. 2,708,246, May 10. Securing shafts in synthetic resin for a commutator.

MOLDING. F. W. Fuller and G. B. Moore. U. S. 2,708,288, May 17. Molding method.

SHEET. W. R. Collings (to Dow). U. S. 2,708,289, May 17. Pressure-sensitive organopolysiloxane sheet.

FILMS. E. E. Magat and D. R. Strachan (to Du Pont). U. S. 2,708,617,

May 17. Condensation polymer films and filaments.

ABRASIVES. H. N. Stone (to Norton). U. S. 2,708,622, May 17. Abrasive-phenolic resin mixes.

LIGNOCELLULOSE. W. T. Glab (to Carr, Adams, and Collier). U. S. 2,708,637, May 17. Molded lignocellulose.

CELLULOSE PLASTIC. L. W. A. Meyer and M. H. Broyles (to Eastman Kodak). U. S. 2,708,638, May 17. Cellulose alkanates stabilized with resorcinol monopiperonylate.

POLYMERS. H. C. Miller (to Du Pont). U. S. 2,708,639, May 17. Polymers of butadiene-1,3.

LAMINATING. J. C. Pullman and D. D. Ritson (to American Cyanamid). U. S. 2,708,650, May 17. Laminating with thermoplastic adhesive.

CELLULAR PLASTICS. R. L. Frank (to Ringwood). U. S. 2,708,661, May 17. Foamed plastics.

COPOLYMERS. J. Downing and J. G. N. Drewitt (to British Celanese). U. S. 2,708,663, May 17. Copolymers of N-methyl maleimide.

POLYMERIZATION. J. P. Jones (to Phillips). U. S. 2,708,664, May 17. Polymerization with peroxide from alkylated vinylcyclohexene.

POLYMERS. C. C. Unruh (to Eastman Kodak). U. S. 2,708,665, May 17. Vinyl benzal acetophenone polymers.

EXTRUSION. I. T. Stoneback (to International Telephone). U. S. 2,708,771, May 24. Extruding plastic sheath around wire conductor.

EXTRUSION. L. J. Moncrieff (to British Celanese). U. S. 2,708,772, May 24. Extruding hollow articles.

LAMINATES. H. Jacque (to Badische Anilin). U. S. 2,709,148, May 24. Vinyl chloride laminates.

POLYMERIZATION. S. B. Luce (to Swift). U. S. 2,709,162, May 24. Polymerization of allyl esters.

COPOLYMER. M. Couper and W. K. Wilkinson (to Du Pont). U. S. 2,709,163, May 24. Acrylonitrile-vinyl pyridine copolymer sulfonic acid reaction product.

MOLDING. H. Beneke, Jr. (to Beneke). U. S. 2,709,280, May 31. Molded article with embedded member.

CLOSURES. H. Rosenthal. U. S. 2,709,290, May 31. Plastic closures.

SCREW ANCHOR. C. J. G. van der Kleij (to H. J. van der Rijn). U. S. 2,709,389, May 31. Plastic wall plug screw anchor.

BABY PANTS. D. L. Greenlee, H. B. Greenlee, and H. M. Zimmerman. U. S. 2,709,437, May 31. Plastic baby pants.

COATINGS. R. M. Evans (to Master Mechanics). U. S. 2,709,664, May 31. Chemical resistant coatings for metals.

RESINS. E. S. Narracott (to Shell). U. S. 2,709,690, May 31. Epoxy resins.

PLASTICIZER. J. Dazzi (to Monsanto). U. S. 2,709,691, May 31. Nonylphenyl, 2-ethylhexyl succinates as plasticizers for polyvinyl chloride.

SILOXANES. G. C. Gainer (to Western Electric). U. S. 2,709,692, May 31. Polyarylsiloxane resins.

CONDENSATES. G. Widmer (to Ciba). U. S. 2,709,693, May 31. Condensates of formaldehyde and amino-1:3:5-triazines.

RESINS. M. A. Dietrich and H. W. Jacobson (to Du Pont). U. S. 2,709,694, May 31. Condensates of polyureas and formaldehyde.

POLYMERIZATION. F. T. Wadsworth (to Pan American Refining). U. S. 2,709,695, May 31. High temperature polymerization of olefin mixtures.

LIGNIN DERIVATIVES. E. G. Wiest and W. J. Balon (to Du Pont). U. S. 2,709,696, May 31. Lignin-formaldehyde products.

EXTRUSION. W. J. Johnson (to L. Danenberg and A. Danenberg). U. S. 2,709,834, June 7. Extruding plasticized material.

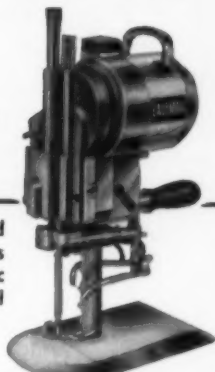
ORNAMENTAL SHEET. G. Markus and M. Siegel (to Aristocrat Leather). U. S. 2,710,046, June 7. Ornamental plastic sheet.

CELLULOSE ESTERS. W. B. Hewson (to Hercules). U. S. 2,710,288, June 7. Sorbic acid esters of cellulose.

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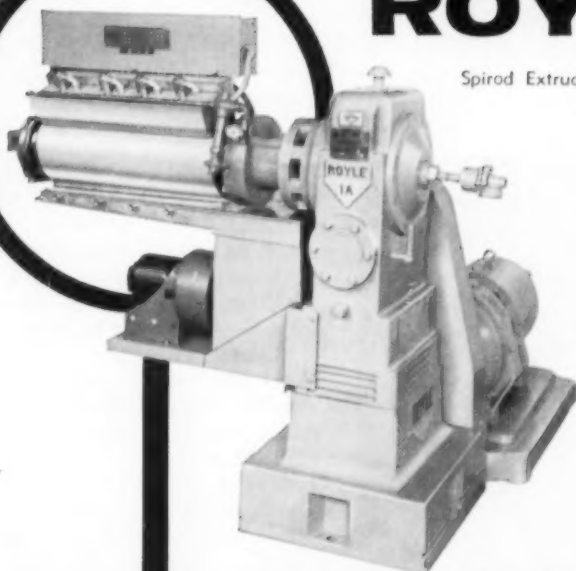
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Pumps—Shorter production cycles resulting from faster pump-down of vacuum metallizing chambers are claimed for Ring-Jet diffusion and booster pumps. The pumps are designed with a ring of jets that replaces the jet cone found in conventional diffusion and booster pumps. This ring of jets is stated to permit the cross-sectional area of the airflow path to be considerably increased, thus increasing the volume of air that can be passed through the pump and, consequently, the pumping speed.

Three sizes of diffusion pumps are available: 10, 14, and 16 inches. At pressure of 0.5 micron, the 10-in. diffusion pump has a pumping speed of 4300 cu. ft./min.; the 14-in. model a speed of 7300 cu. ft./min.; and the 19-in. pump a speed of 11,000 cu. ft./minute. These performance characteristics make the pumps especially suitable for medium- and large-size vacuum metallizers.

Two booster pumps are offered: 4 and 6 inches. The 6-in. booster pump is said to be capable of handling the

output of three 14-in. diffusion pumps; and the combination will exhaust the 128-cu. ft. chamber of a 72-in. vacuum metallizing unit to a pressure of 0.5 microns in less than 7 minutes. The 4-in. booster pump performs correspondingly for smaller units. *F. J. Stokes Machine Co., 5500 Tabor Rd., Philadelphia 20, Pa.*

Hydraulic Press—Model 300 is a single-action hydraulic press, electrically controlled for either automatic or semi-automatic operation. Slide return may be controlled by either pressure or length of stroke setting. Pump by-passes at zero pressure. Press is available in capacities of 50, 100, 150, 200, and 300 tons. *Clifton Hydraulic Press Co., 288 Allwood Rd., Clifton, N. J.*

Printing Machine—A two-color printing machine for printing on vinyl film comes in standard width of 60 in., but can be built to any width desired. The printing head consists of a welded steel frame with neoprene roller and two-way ad-

justment; two "W" bore mandrels moving on roller bearings; two doctor blade holders with steps; and two galvanized pans 2 in. deep. The machine is furnished with a 1:7-ratio U.S. Vari-Drive unit, necessary drive shafts, and "V" pulleys and belts. An optional "J"-type unwind and rewind unit is available. *Liberty Machine Co., Inc., 275 Fourth Ave., Paterson, N. J.*

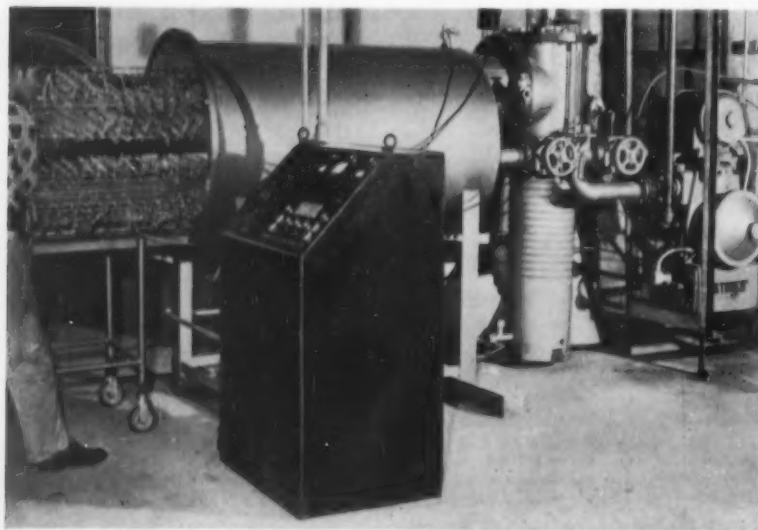
Program Controllers—Line of instruments is designed to provide automatic process control of any time-temperature cycle with off-on, proportioning, high-limit, or stepless control action, plus secondary control action. Once the desired time-temperature cycle for a given process has been determined, it can be repeated automatically as often as desired.

In the instrument's indicating system, the current generated by a thermocouple actuates a millivoltmeter and controls an indicating pointer. In the control system, a setting arm carrying the setting pointer is moved along the scale by a controlling cam, which in turn is driven by a synchronous electric motor. Control is obtained through use of a flag on the indicating pointer which interrupts the light beam between a photo cell and light source that is mounted on the setting arm. The output of the photo cell is amplified by a magnetic amplifier (eliminating use of vacuum tubes and incident maintenance problems).

Four models are available: Model JG is used where off-on control is suitable; Model JPG, where proportioning control is required; Model JLG, where an alarm or other switching action in high-limit safety application is desired; and Model JSG, where extremely accurate stepless control must be maintained.

A secondary control incorporated in the instruments enables users to start or stop cycles at any predetermined time, or to operate auxiliary equipment such as relays, timers, additional heating units, blowers, alarms, etc. *West Instrument Corp., 525 N. Noble St., Chicago 22, Ill.*

Milling Machine—Keller tracer-controlled milling machine, designated BL 3622 Model C, is designed to accommodate heavier work than other models in this particular line. Spindle power is 10 hp., and spindle



Stokes' 14-in. Ring-Jet diffusion pump gives rapid pump-down for vacuum metallizing unit

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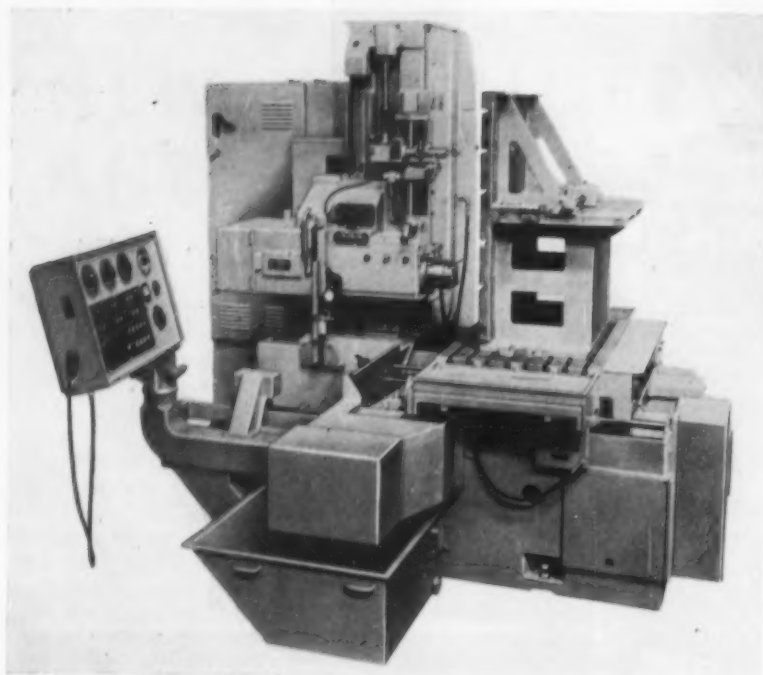
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Pratt & Whitney's Keller tracer-controlled milling machine has spindle power of 10 hp., spindle speeds ranging from 30 to 3600 r.p.m., and 48- by 30-in. working table surface

speeds range from 30 to 3600 r.p.m. in 20 steps. Spindle is furnished with either No. 12 B&S or No. 50 MM taper bore. Horizontal travel is 26 in., vertical travel is 22 in., and transverse travel is 12 in.; area of table working surface is 48 by 30 inches.

Slides of the machine have phenolic-to-metal bearing surfaces, lead screws are molded of phenolic. Absence of metal-to-metal sliding surfaces is said to eliminate the possibility of scoring.

Lubrication is accomplished with an automatic one-shot system. Automatic chip removal and cooling systems are provided. *Pratt & Whitney, Div. Niles-Bement-Pond Co., West Hartford 1, Conn.*

Pneumatic Press—Light-duty, 2-ton pneumatic press for drawing and forming cast or extruded plastics sheet, is intended particularly for drawing round, oval, or special-shaped covers for plastic containers and similar objects. The press is designed to take interchangeable dies for draw forming and embossing parts from 2 to 8½ in. in diameter and ¼ to 1 in. high.

The press has two safety buttons which the operator must actuate be-

fore machine will operate. Sequence of operations is as follows:

Electrically heated upper die assembly moves downward to exert pressure on the plastic blank and remains in this position during the drawing operation. The pressure of the upper die against the plastic blank is applied by pneumatic means and is adjustable from 5 p.s.i. to full line pressure. A forming punch closely follows the upper die in its



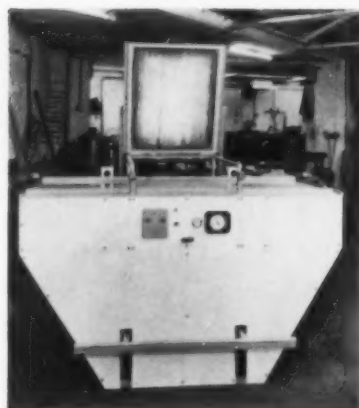
Taber Instrument's 2-ton pneumatic press is designed for drawing and forming cast or extruded plastics sheet

downward movement and immediately contacts the softened thermoplastic material and forms the part. After a short strain-relief period of ½ to 1 sec., there is an audible click, indicating the part has been trimmed. Following this click, the operator removes his hands from the safety buttons and the upper die and forming punch immediately return to their starting position. As the ram starts its upward travel, the formed part is blown through the opening of the lower die and a chute at the side of the machine. The surface of the die is automatically cleared of the trim from the previous operation by compressed air. Production rate is 12 to 15 parts per minute. *Taber Instrument Corp., North Tonawanda, N. Y.*

Steam Trap—Model TD-50 is an addition to a line of "thermodynamic" steam traps (traps in which the kinetic energy of the steam closes the valve). The trap can be used for any pressure from 10 to 600 p.s.i. and temperatures to 950° F. Construction details and data on the principle of operation of thermodynamic steam traps in general have been published in these columns previously. (See *MODERN PLASTICS* 32, 148, July 1955). *Sarco Co., Inc., Empire State Bldg., New York 1, N. Y.*

Skin Packaging Machine—Vacuum forming machine, especially engineered for skin packaging operations—a method of packaging in which items to be packaged are first positioned on printed display cards and a thin-gage heat-sealing plastic sheet drawn down over the cards to form a virtually invisible protective skin over the items—differs from conventional vacuum forming machines in several respects. (While developed for skin packaging, the unit is said to be also capable of performing conventional vacuum forming operations.)

The heater does not slide, but swings back for each operation. Vacuum release is accomplished by means of a foot-operated bar running along the entire length of the front of the machine. The bar can be actuated from wherever at the machine the operator happens to be. Pilot lights indicating end of preset cycles are visible from the right or left side of the forming boxes. Two



Morane Plastic's vacuum forming machine designed primarily for skin packaging uses. Heater is in up position

forming boxes are used (held together by bars). When one is under the heater, the other can be assembled. The clamp is not on the frame of the machine but on the boxes. At the end of a cycle, the second box is slid into position and the first box is re-assembled on the other side of the machine. Height of heater is adjustable. Patents for the unit have been applied for.

Maximum size of cards on which items can be skin-packaged on this machine is 20 by 25 in., with special apparatus available for larger sizes. The machine is adjustable for smaller sizes. Maximum depth of articles to be skin-packaged is 1½ in., length and width can be any size within the limits of the card. Maximum speed for maximum size is 150 to 300 cards per hour. Films to be used in packaging are in the following gages: for articles up to ½ in. deep—0.001 or 0.0015 in., for deeper objects—0.003 or 0.005 inch.

Dimensions of the equipment are as follows: length—6 ft., width—2 ft. 10 in., height—4 ft. 4 in. (heater down) and 6 ft. 7 in. (heater up). Approximate weight—800 pounds. Morane Plastic Co., Ltd., 21 Woodthorpe Rd., Ashford, Middlesex, England

Reinforced Plastics Press—For molding glass-reinforced plastics laminates, 250-ton press has 8- by 5-ft. platens. The main ram is 28 in. in diameter and has a stroke of 4 feet. Maximum mold size is 96 by 60 in.; daylight 78 inches. The press operates at a maximum pressure of

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1000 p.s.i. and carries the upper platen through two cylindrical distance pieces, each 15 in. thick. These distance pieces are attached by a ring of bolts and can be detached to increase effective daylight between platens. Two return rams are 6 in. in diameter and operate at 25 tons; an intensifier can be added to double return load.

The hydraulic system which feeds the main and return rams is operated by a vane-type pump driven by a 25-hp. motor and is fed from a 200-gal. tank. Two low-pressure, high-capacity pumps and one high-pressure, low-capacity pump, are built as one unit with their motor. The pumps feed into a common manifold from which the hydraulic supply to the cylinders is controlled by valves. Reduction of the hydraulic supply pressure to the main ram on the downward stroke can be carried out—when the press is required for small moldings—by manual adjustment of a pressure-reducing valve. The pressure on the main ram is shown by gages. These are duplicated and placed adjacent to the

valve on top of the press and at the base near the front-loading position. Guard gates are provided for both front and back of press.

Press provides slow initial opening and closing, and rapid movement of the ram in both upward and downward directions at the upper portion of the stroke. Position at which change of speed takes place can be controlled.

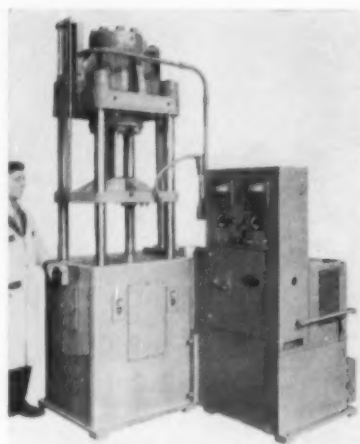
Over-all height of the press is 20 ft., weight approximately 23 tons. Press can be floor mounted (with lower platen at a 4-ft. height), or can be sunk into a shallow pit to bring surface of lower platen to floor level to facilitate loading. *T. H. & J. Daniels Ltd., Stroud, Glos., England.*

Compression Press—Model 400-75, 75-ton press for compression molding of phenolics, ureas, alkyds, Teflon, melamines, Glaskyd, and other thermosetting materials, is available with both automatic powder feed and rope feed attachments. The machine can be operated manually, semi-automatically, and automatically; and is claimed to be the only 75-ton automatic press on the market today. Press has closure speed from 9.6 to 366 in./min., with automatic deceleration possible at any point in the pressing stroke. Complete flexibility of control over any kind of cycle is claimed.

Motor, pump, and valves are easily accessible. Hydraulic reservoir is separate, with a thermostatically controlled water cooling system. The hydraulic system is powered by an Oilgear duplex axial piston-type pump.

Electrical controls are included as original equipment and provide for automatic feeding, automatic ejection, automatic flash clean-out, degassing, and deceleration. Potter & Brumfield throw-away-type relays are used to permit instant change without downtime. An emergency button returns press to top of stroke from any point in the cycle. Wheelco mold temperature control instruments are optionally available. A limit switch for prevention of mold damage is incorporated. Standard equipment includes double hydraulic ejection; provision is made for upper and lower knockouts.

Stroke of press is 12 in.; daylight with fixed head is 28 in.; over-all height is 96 in.; weight is 700 lb.; top-mounted 60-sq. in. hydraulic



Baker Bros.' Model 400 compression press for molding thermosets is designed for fully automatic operation

cylinder has working pressure of 2650 p.s.i. to deliver 75 tons. Automatic feeders available for this press include the following: eight-cavity feeder, each chamber individually adjustable, maximum charge per chamber 65 cc.; four-cavity feeder with four adjustable chambers, maximum charge per chamber 220 cc.; rope feeder with adjustable loading bucket; and loading board for multiple cavities. *Baker Bros., Inc., P. O. Box 101, Station F, Toledo 10, Ohio.*

Test Equipment—Model L-8 is designed for the determination of tensile stress (modulus), tensile strength, percent elongation, and resistance to tear of elastomeric materials at temperatures ranging from -70 to 550° F. Where only elevated temperatures are required, a high-temperature conditioning unit can be provided that maintains the test chamber at any selected temperature from room temperature to 550° F. *Scott Testers, Inc., 96 Blackstone St., Providence, R. I.*

Wiping Machine—Automatic rotary wiping machine eliminates hand-wiping of parts after mask-controlled spray painting. A variable-speed table, mounting 24 revolving work holders, is said to permit production rates from 700 to 3600 wiped pieces per hour. Operator, seated at the machine, feeds pieces to be wiped into the machine. The parts moving under the wiping



Daniels' 250-ton press for molding reinforced plastics has 8- by 5-ft. platens, daylight of 78 inches



Conforming Matrix's rotary automatic wiping machine permits production of from 700 to 3600 pieces per hour

cloth are revolved until clean, and then removed from the spindle by an unloading device.

The equipment occupies less than 5 sq. ft. of floor area and is powered by a ¼-hp., explosion-proof motor. It is mounted on casters. *Conforming Matrix Corp., 364 Toledo Factories Bldg., Toledo 2, Ohio.*

Sheet Forming Machine—A vacuum and drape forming machine, designated Meteor, has been developed for production, model, and test work, as well as for short runs. The machine will form, drape, or draw to a 15-in. depth; it is available in three standard sizes with mold areas of 20 by 30 in., 30 by 30 in., and 30 by 36 in., or can be furnished in other sizes or custom-built to requirements. Standard equipment includes vacuum pump, tank, gages, and motor; clamp and drape mechanism; heating elements, switches, and timers. *Comet Industries, Franklin Park, Ill.*

Timers—Combination push-button and timer eliminates the necessity of separate push-button station and timer, as well as connecting wiring; it is intended for applications where it is important to regulate accurately and consistently the length of time interval related to the start of a cycle. The combination push-button timer can also be arranged in cascade where one unit starts the cycle and modified additional units time out successive intervals.

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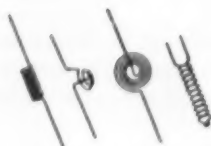
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easily adjusted by means of knurled thumbnuts which permit adjustment of pointer and tripper on dial. Dial resets automatically after each cycle and repeats within $\frac{1}{2}\%$ of overall range. Seely Instrument Co., Inc., Niagara Falls, N. Y.

Vacuum Forming Machine—This automatic vacuum forming machine is designed with two operating stations next to each other, and with a traveling oven. The base tables will form sheet up to 31 by 41 in.; extension tables and oven units are available to permit handling of sheets up to 60 by 96 inches. For deep-draw parts requiring plug-and-ring forming, special press with air cylinders may be obtained.

With materials requiring heating and forming cycles which are slow enough for one operator to remove formed sheet and reload fresh sheets while another sheet is being heated, one-man operation is said to be possible. With materials that cycle faster, two operators work side by side. Separate timing controls permit two different forming operations to proceed at each station.

Cycling operations of the sheet carriers are pneumatic and the oven contains height adjustments for obtaining optimum heating characteristics. The Whitlock Co., 3655 No. Southport Ave., Chicago 13, Ill.

Engraving Machine—Model SR 54 engraving machine is designed to produce 23 different sizes of characters between 0.02 to 2 inches, using the same templet. The pantograph has fine reduction between 1:2 to 1:6. An extension that may be fitted to the table permits work up to 24 by 24 in. to be accommodated. Depth of engraving is adjustable between 0.004 to 0.059 in.; cutter runs at 13,000 r.p.m.

In addition to hollow engraving, relief engraving can be accomplished by use of special templates. Working surfaces can be flat, concave, convex, or irregular. Scripta Machines à Graver, 7 Passage Turquetil, Paris 11e, France.

Slicing Equipment—Universal slicing machine is said to cut to any desired width most soft materials (sponge plastic, foam rubber, felt, etc.). The machine has automatic winding feature. Case-Maul Mfg. Co., Mansfield, Ohio.



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Seven papers on testing, evaluation, and performance of building construction, presented at the 57th Annual Meeting of the American Society for Testing Materials, have been collected in this volume. Subjects covered in these papers, except those dealing with building construction in a general way, include primarily topics concerned with traditional building methods, e.g., transverse strength of masonry walls, wood diagram tests, glued and nailed roof trusses, and the like.

"A.S.T.M. Standards in Building Codes"

Published in 1955 by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. 973 pages. Price \$6.00.

Over 250 A.S.T.M. specifications, methods of test, and definitions of materials included by reference in the major building codes of the United States and Canada, and heretofore only to be found scattered throughout the 10,000-page seven-part book of A.S.T.M. Standards, have now been compiled into this single volume. The standards in this compilation cover the full range of construction materials, including plastics.

Teflon products—Three bulletins cover a line of Teflon packings, gaskets, special parts, and stock. Bulletin CP552 gives descriptions of Teflon ring packing, Teflon-impregnated asbestos packing, V-type packings, and patented Teflon Seal Cage. Bulletin CP553 covers Teflon-jacketed gaskets, solid-ring gaskets, Teflon expansion joints, and special Teflon gaskets. Bulletin CP554 illustrates molded and machined parts of pure Teflon, glass-filled Teflon, glass- and carbon-filled Teflon, and zircon-filled Teflon. In addition, it

lists molded and extruded Teflon stock, including Teflon sheets, molded cylinders, tape, extruded tubing, and rods. *Chemical & Power Products, Inc., 11 Broadway, New York 4, N. Y.*

Sanitation standards—This report covers the first 10 years of work by the National Sanitation Foundation. The organization and its testing laboratory have offered a program of research, education, and service in the field of sanitation and cleanliness. Its separately incorporated testing laboratory now offers the first sanitation Seal of Approval which can eventually be applied to all products and equipment which, in their use, effect the health of the user and the public. *The National Sanitation Foundation, School of Public Health, University of Michigan, Ann Arbor, Mich.*

Vinyl fabrics—Sample book contains swatches of vinyl sheeting for furniture applications. *Columbus Coated Fabrics Corp., Columbus, Ohio.*

Defoamers—Properties and performances of silicone defoamers are detailed in this four-page brochure. Suggested concentrations, dispersing media, and application methods are discussed, along with actual working examples in fields ranging from food processing to metalworking. *Dow Corning Corp., Midland, Mich.*

Polyethylene coloring—One-page bulletin describes a pigmented polyethylene "concentrate" to be used in conjunction with natural polyethylene for the extrusion and molding of colored products. The fully dispersed concentrate is produced by compounding pigments in virgin polyethylene. One part of concentrate is combined with three parts of natural polyethylene to make the molding compound. No special equipment is said to be needed, and there is reportedly no dust or dan-

ger of contamination. Small bags containing samples of the colored concentrate are attached to the bulletin. *Gering Products, Inc., Kenilworth, N. J.*

Industrial heating—This handbook is designed to provide plant management and engineers with basic concepts of industrial heat processing and heat control. For the more technical-minded, the common formulas used in calculating heat and oven requirements are included. *Michigan Oven Co., 415 Brainard, Detroit 1, Mich.*

Reinforced plastics—Promotional literature contains several designs for awnings, using reinforced plastics sheet. *Monsanto Chemical Co., Organic Chemicals Div., St. Louis 4, Mo.*

Dip-coating—Bulletin No. 1 outlines steps in dip-coating products with plastisol formulations, giving temperatures and heating periods for sample applications. A discussion of dip-coating with and without preheating is included. *Chemical Products Corp., King Philip Rd., East Providence, R. I.*

Hydraulic presses—Twelve-page brochure illustrates a line of hydraulic presses. Photographs of actual plant installations are included. This booklet is mainly descriptive, does not contain specifications. *Fjellman-American, Inc., P. O. Box 1203, Joliet, Ill.*

Adhesive tapes—Two tapes are described in four-page folder: Polyken No. 320, polyethylene-coated tape, provides an almost moisture-proof barrier and is used in government packaging where JAN-P-127 Type I Grade A is specified; Polyken No. 210 finds application where low-cost packaging of spare part items is required. *Polyken Products, Dept. of The Kendall Co., 309 W. Jackson Blvd., Chicago 6, Ill.*

Polyethylene sheeting—Bulletin NP-13, "Current Status of Polyethylene Sheet Material," deals with 0.015-in. gage to 0.125-in. gage materials inclusive, and presents suggested uses of heavy-gage polyethylene, its properties, and its chemical resistance. Heavy-gage polyethylene is a comparatively new industrial ma-

terial with wide potential where corrosion and chemical resistance are factors. *Celanese Corp. of America, Plastics Div., 290 Ferry St., Newark 5, N. J.*

Chemicals catalog—Sixteen-page booklet describes the uses and suggested applications of over 90 castor oil products. The more important physical and chemical characteristics are tabulated. General classes of products covered include refined, blown, dehydrated, and hydrogenated castor oils, esters, fatty acids, metallic soaps, and specialties. Also included are a list of available technical literature and a series of charts on such properties as solubility, compatibility, and viscosity. *The Baker Castor Oil Co., 120 Broadway, New York 5, N. Y.*

Nylon molding—Molding characteristics and physical properties of Plaskon Nylon 8200 are presented in this booklet. Product data tabulation and charts are included. *Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.*

Tooling equipment—Brochure lists a complete line of materials and equipment, as well as facilities for the tooling and production industry. Items described include octopus-grip vacuum chuck, a line of Hetzel pumps, tooling materials, cast aluminum heating platens, and lay-up molds; facilities outlined include a complete tool engineering service. *Pioneer Tool Engineering, Inc., 1601 E. El Segundo Blvd., El Segundo, Calif.*

Counter tops—Illustrated instruction booklet gives step-by-step procedures on the installation of Curvatop, a preformed counter-top plastic surfacing material. Curvatop is available in standard counter-top dimensions (96 in. long and 25½ in. wide with 4¾ in. backsplash) and in 10 patterns and colors. *Consoweld Corp., Wisconsin Rapids, Wis.*

Fire prevention—"Fire Hazards of the Plastics Industry," prepared by the National Board of Fire Underwriters in cooperation with the S.P.I. Committee on Fire Prevention, is a revision of a research report first issued in 1946. Its objective is to provide insurance officials, public authorities, and fire protection en-

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Hydraulic Oils MUST BE CLEAN
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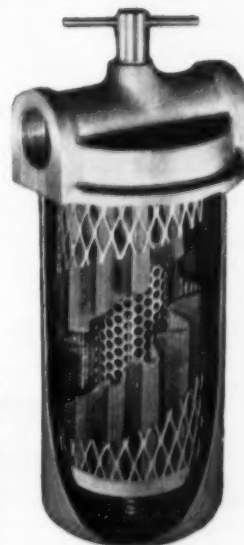
The Synclinal design of Marvel Filters provides that all-important balance between maximum ACTIVE filtering area and sufficient storage capacity for filtered out particles. Thus, longer periods of productive operation are attained before filter cleaning is necessary. Marvel Synclinal Filters are easy to clean because both the sump and line type may be disassembled, thoroughly cleaned and reassembled in a matter of minutes. Line type operates in any position and may be serviced without disturbing pipe connections.

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Company

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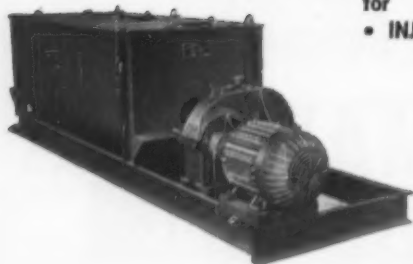
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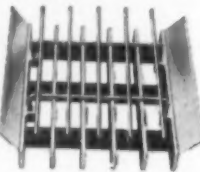
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gineers with a condensation of the essential information on the composition and classification of plastics, methods of manufacture, and fabrication of finished products. Included for the benefit of key operating and plant safety personnel, is a discussion of fire and explosion problems associated with the manufacture of basic resins, the production of molding compounds, and the fabrication of end-use products. There is also included a hazard survey and safety program, along with appended tables on fire properties of the principal hazardous materials used in the plastics industry, thermal burning characteristics of various plastics, and a tabulation of identifiable tradenames. *The Society of the Plastics Industry, Inc.*, 67 W. 44th St., New York 36, N. Y.

Half-second butyrate—Convenient, quick-reference handbook for people who formulate and sell lacquers covers properties, modifications, and applications of half-second (film-forming) butyrate. Suppliers from whom raw materials may be secured are listed. *Eastman Chemical Products, Inc.*, Kingsport, Tenn.

Safety—Occupational Safety Service Guide (Service Guide 2.1) provides company safety directors with a complete catalog of available accident prevention aids. *National Safety Council*, 425 N. Michigan Ave., Chicago 11, Ill.

P.V.A. products—Four-page bulletin lists a line of plastic hose and hose assemblies, sheets, and molded products made of a modified polyvinyl alcohol resin processed into a tough, strong, and flexible elastomeric material. The material is said to be entirely unaffected by all water-insoluble liquids, including those which attack solvent-resistant synthetic rubber formulations. Bulletin lists physical and chemical properties of the material, including permeability to gases. Applications are discussed. *Resistoflex Corp.*, 39 Plansoen St., Belleville, N. J.

Alkyds—Revised folder presents product data on granular, putty, and glass-reinforced alkyd molding compounds. Six mineral-filled and three fibrous glass-reinforced molding compounds are covered. A graph illustrates the relative insulating per-

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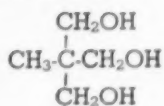
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*Advanced degree and experience
in organic compounds are preferred
but not required.*



formance characteristics of these molding compounds when exposed to elevated temperature and humidity. *Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.*

Plastics decorations—Full color 1955 catalog lists a line of three-dimensional, illuminated home and display Christmas decorations. *L. A. Goodman Mfg. Co., 131-145 W. 63rd St., Chicago 21, Ill.*

Publicity film—"To Shape Tomorrow" is a 30-min. film describing recent advances in some uses of plastics. It covers recent applications for shell molding resins, polyester resins, vinyl, and decorative laminates. The film is available in 35-mm. and 16-mm. Eastmancolor prints and is intended for free private showing to technical and interested lay audiences. Requests for loan of film should be addressed to *Publicity Dept., Bakelite Ltd., 12-18 Grosvenor Gardens, London S. W. 1, England.*

Reinforced plastics pipe—Folder describes a fibrous glass-reinforced plastic pressure pipe for petroleum, chemical, mining, agriculture, food and beverage, utilities, construction, and electronics industries. The pipe, and a complete line of fittings, is available in diameters up to 12 inches. *Refin Co., 5730 Kearny Villa Rd., San Diego, Calif.*

Specialized services—Facilities of a newly created special products division whose services are available on a contract production basis, are outlined in four-page Bulletin 100. This division is primarily concerned with new developments in plastics materials, processing techniques, and applications. *Boonton Molding Co., Boonton, N. J.*

Molding techniques—A pictorial review of typical plastics parts produced by six molding methods is contained in this eight-page brochure. A brief description of equipment used to produce the parts by compression, injection, automatic rotary, Stokes automatic, and extrusion molding methods is included. Accompanying photographs illustrate some of the sizes, shapes, and finishes which can be produced by the different methods. Problems of

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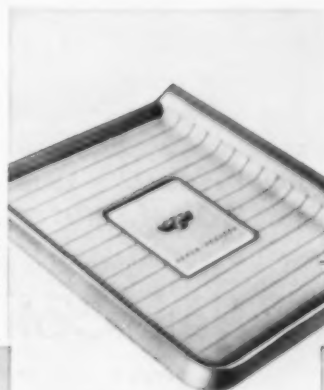
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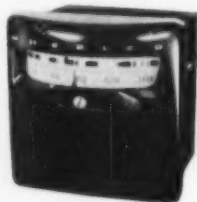
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product styling, mold design, sample and materials testing, quality control, and other considerations when producing a plastic part are also covered. *Auburn Button Works, Auburn, N. Y.*

Diethylene glycol—Bulletin H-2 analyses physical properties of DGL, a diethylene glycol monolaurate, blended with selective modifying agents. The product is said to be self-emulsifying in water, and a powerful emulsifying agent of other materials. Resulting emulsions are of the oil-in-water type. DGL is moisture-free, and at normal emulsifying temperatures does not evaporate. Further, it does not thicken on aging and, used in small amounts, is effective as an anti-foaming agent. Recommended to the paint industry as an anti-foaming agent in latex and resin emulsion paint systems, the material can also be an effective emulsifying agent in these products. As a plasticizer, DGL finds use in printing ink pastes, in lacquer manufacture, and as an emulsifying agent for resinous coating and impregnating compounds. *Witco Chemical Co., 122 E. 42nd St., New York 17, N. Y.*

Technical data—"Selected Scientific and Engineering Tables and Data" is a 112-page paper-bound volume containing selected chemical and physical, engineering, plastics, bacteriological, leather, psychometric, and textile tables and charts, arranged for easy reference. *United States Testing Co., Inc., 1415 Park Ave., Hoboken, N. J.*

Phenolics—Physical and electrical properties of a line of phenolic molding materials are concisely presented in this 12-page booklet entitled "Facts on Phenolics." Grades covered include standard, lower-pressure, high-quality, and special-property general-purpose materials in black and brown; medium-impact and medium-impact special-property formulations; high-impact materials; nitrile rubber-bearing materials; electrical insulating materials; heat-resistant materials; non-bleeding materials; and formulations with high chemical and moisture resistance. *Durez Plastics Div., Hooker Electrochemical Co., North Tonawanda, N. Y.*



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PLASTICS AND SYNTHETIC RESIN PRODUCTION

From Statistics Compiled

| Materials | Total p'd'n. first 5 mos. 1955 | Total sales first 5 mos. 1955 |
|--|--------------------------------------|-------------------------------------|
| CELLULOSE PLASTICS: ^a | | |
| Cellulose acetate and mixed ester | | |
| Sheet, under 0.003 gage | 7,826,915 | 7,680,225 |
| Sheets, 0.003 gage and over | 6,300,023 | 5,869,325 |
| All other sheets, rods, tubes | 3,171,384 | 2,835,595 |
| Molding, extrusion materials | 36,840,041 | 35,735,278 |
| Nitrocellulose sheets, rods, tubes | 2,091,363 | 2,239,143 |
| Other cellulose plastics | 3,000,158 | 2,766,079 |
| PHENOLIC AND OTHER TAR-ACID RESINS: | | |
| Molding materials ^a | 88,423,865 | 81,322,654 |
| Bonding and adhesive resins for: | | |
| Laminating (except plywood) | 28,233,531 | 20,291,937 |
| Coated and bonded abrasives | 5,907,889 | 6,353,242 |
| Friction materials (brake linings, clutch facings, etc.) | 10,359,984 | 9,502,908 |
| Thermal insulation (fiber glass, rock wool) | 17,139,973 | 17,500,448 |
| Plywood | 18,659,135 | 15,492,890 |
| All other bonding and adhesive uses | 6,984,849 | 7,099,590 |
| Protective-coating resins | 10,513,735 | 10,409,820 |
| Resins for all other uses | 16,653,403 | 15,376,931 |
| UREA AND MELAMINE RESINS: | | |
| Textile-treating and textile-coating resins | 18,151,369 | 17,428,089 |
| Paper-treating and paper-coating resins | 9,098,186 | 8,970,783 |
| Bonding and adhesive resins for: | | |
| Plywood | 39,594,083 | 36,703,771 |
| All other bonding and adhesive uses, including laminating | 11,847,711 | 11,780,026 |
| Protective-coating resins | 15,531,644 | 11,844,557 |
| Resins for all other uses, including molding | 33,985,603 | 32,751,600 |
| STYRENE RESINS: | | |
| Molding materials ^a | 167,640,170 | 159,272,604 |
| Protective-coating resins | 41,826,457 | 40,286,584 |
| Resins for all other uses | 34,137,743 | 33,837,203 |
| VINYL RESINS, total^b | | |
| Polyvinyl chloride and copolymer resins (50 percent or more polyvinyl chloride) for: | | |
| Film (resin content) | | 36,161,346 |
| Sheeting (resin content) | | 22,226,993 |
| Molding and extrusion (resin content) | | 77,311,212 |
| Textile and paper treating and coating (resin content) ^c | | 25,762,198 |
| Flooring (resin content) | | 24,603,384 |
| Protective coatings (resin content) | | 12,437,907 |
| All other uses (resin content) | | 18,555,424 |
| All other vinyl resins for: | | |
| Adhesives (resin content) | | 13,181,772 |
| All other uses (resin content) | | 42,534,372 |
| COUMARONE-INDENE AND PENTOLEUM POLYMER RESINS | | |
| | 105,293,204 | 104,733,863 |
| POLYESTER RESINS: | | |
| For reinforced plastics | 21,320,397 | 17,497,483 |
| For all other uses | 1,583,016 | 1,872,875 |
| POLYETHYLENE RESINS: | | |
| MISCELLANEOUS: | | |
| Molding materials ^{a, d} | 105,971,636 | 78,756,013 |
| Protective-coating resins ^e | 1,899,601 | 1,123,510 |
| Resins for all other uses ^f | 48,396,354 | 67,738,405 |

^a Dry basis designated unless otherwise specified.

^b Partially estimated. ^c Revised.

^d Includes fillers, plasticizers, and extenders. ^e Production statistics by uses are not representative, as end use may not be known at the time of manufacture. Therefore, only statistics on total production are given. ^f Includes

IN POUNDS* FOR APRIL AND MAY 1955
by U. S. Tariff Commission

| April** | | May** | |
|------------|------------|------------|------------|
| Production | Sales | Production | Sales |
| 1,398,906 | 1,452,743 | 1,253,143 | 1,359,224 |
| 1,243,176 | 1,108,227 | 1,349,317 | 1,185,311 |
| 623,169 | 567,009 | 644,967 | 563,701 |
| 7,574,476 | 7,406,053 | 7,758,301 | 7,464,172 |
| 427,180 | 433,764 | 402,714 | 396,181 |
| 584,278 | 478,399 | 560,509 | 609,946 |
| 18,876,464 | 16,372,342 | 17,707,929 | 16,097,186 |
| 5,159,155 | 3,820,505 | 5,974,164 | 4,439,375 |
| 1,204,860 | 1,262,860 | 1,428,918 | 1,387,774 |
| 2,188,320 | 1,958,151 | 2,111,997 | 2,097,977 |
| 3,624,480 | 3,667,114 | 4,170,813 | 4,059,745 |
| 3,672,430 | 2,975,713 | 3,434,167 | 2,763,650 |
| 1,352,704 | 1,320,364 | 2,138,443 | 2,129,372 |
| 2,568,338 | 2,291,343 | 2,431,254 | 2,061,582 |
| 3,370,039 | 3,270,370 | 2,899,993 | 2,540,412 |
| 3,496,609 | 3,443,276 | 3,377,497 | 3,186,324 |
| 1,958,882 | 2,038,283 | 1,744,910 | 1,697,081 |
| 7,741,433 | 7,583,765 | 8,399,031 | 7,560,602 |
| 3,058,263 | 2,579,109 | 1,908,848 | 1,970,105 |
| 3,086,175 | 2,317,829 | 3,548,538 | 2,651,434 |
| 7,455,711 | 6,767,495 | 7,205,446 | 6,801,341 |
| 34,996,616 | 33,857,545 | 35,470,807 | 31,816,171 |
| 8,304,109 | 8,469,020 | 9,059,629 | 7,720,016 |
| 6,827,738 | 7,424,837 | 7,078,697 | 7,532,005 |
| 56,773,223 | 56,842,499 | 60,216,729 | 54,255,754 |
| | 8,227,049 | | 6,984,897 |
| | 4,709,243 | | 4,429,090 |
| | 15,568,118 | | 14,452,489 |
| | 5,779,100 | | 5,240,024 |
| | 5,134,130 | | 5,108,558 |
| | 2,601,266 | | 2,448,552 |
| | 3,271,231 | | 3,546,613 |
| | 2,585,550 | | 2,808,894 |
| | 8,966,812 | | 9,236,637 |
| 22,533,226 | 23,011,097 | 22,503,247 | 21,007,363 |
| †4,840,027 | †4,115,137 | 4,929,504 | 4,400,101 |
| †173,840 | †237,713 | 297,626 | 248,357 |
| 31,279,536 | 28,183,489 | 32,324,401 | 27,948,506 |
| 4,414,154 | 4,112,315 | 4,276,291 | 3,964,878 |
| 408,057 | 248,117 | 370,686 | 196,254 |
| 7,138,568 | 6,542,703 | 6,738,794 | 6,631,280 |

data for spreader and calendaring-type resins. * Includes data for acrylic, polyethylene, nylon, and other molding materials. * Includes data for epichlorohydrin, acrylic, polyester, silicone, and other protective-coating resins. † Includes data for acrylic resin modifications, nylon, silicone, polyethylene, and other plastics and resins for miscellaneous uses.

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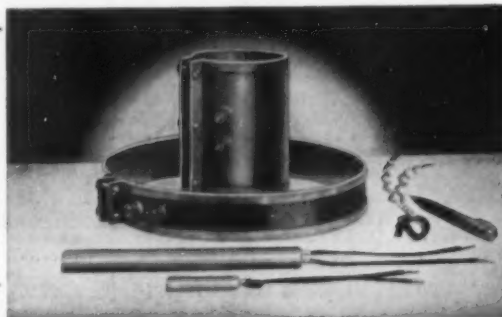


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Better Than Wood

SWITCH-OVER from wood to formed styrene copolymer sheet in the construction of tray inserts used in drift indicator kit boxes marketed by Eastman Oil Well Survey Co., Denver, Colo., has resulted in better service at reduced cost.

Drift indicator kits are usually stored and transported in metal boxes. To keep the delicate instruments which comprise the kit from rolling around, a tray must be provided in each box. For many years, hollowed-out, contoured wooden inserts served this purpose—but none too satisfactorily. When the wood shrank, for example, the instruments would rattle around in the boxes. The wooden trays also had a tendency to split, were difficult to clean, and, in addition, were costly to produce.

With the switch to trays formed of styrene copolymer sheet, all of these problems were eliminated. Because of the resiliency of the material, the plastics inserts fit snugly even when the metal boxes vary in size (the rigid wooden trays were difficult to fit). The plastic tray is also easy to clean, is tough enough to last for years, and, because it is relatively soft, does not scratch the instruments. Finally, by using a simple plug-and-ring forming operation, the trays can be produced at low costs.

CREDITS: Trays are formed by Eastman Oil Well Survey Co., by Denver Plastics, Inc., Golden, Colo., using Boltaron styrene copolymer sheet supplied by Bolta Products, Inc., Div. General Tire & Rubber Co.



Formed styrene copolymer sheet successfully replaces wooden trays

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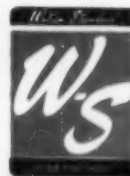
| | |
|------------------------|-----------------|
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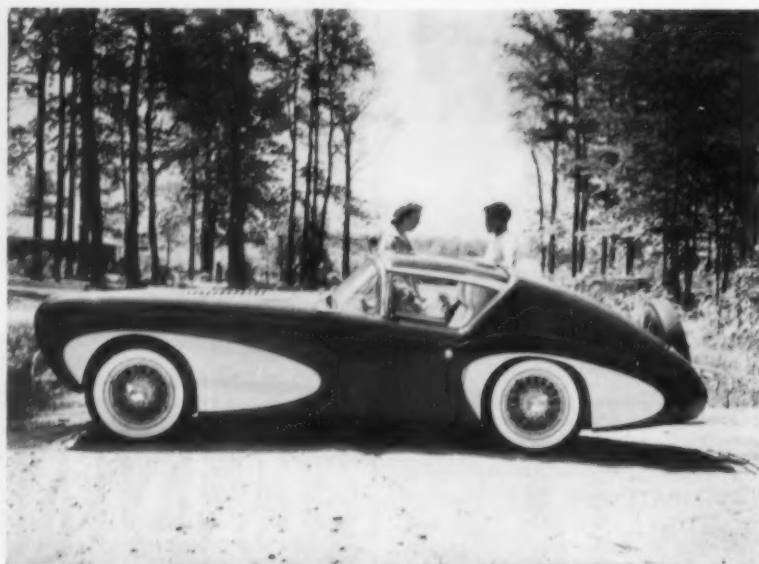
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Retracting formed transparent acrylic canopy of new sports convertible is designed to roll back on tracks into the teardrop-styled tail deck of the reinforced plastics body

Sports Car Body and Top in Plastics

UNORTHODOX in both styling ideas and construction techniques, a new prototype sports car convertible has a reinforced plastics body and an acrylic top—a combination which makes it outstanding among today's "dream cars."

Called the Forerunner and styled by William Flajole, consultant for American Motors Corp., the new car embodies intricate compound curves and perforated planes not previously attempted on a reinforced plastics body. Even underhood fittings and hangers are molded directly into the body of this plastics car.

Male plaster molds were used for the lay-ups of fibrous glass cloth and polyester resin. To strengthen the flush hood and prevent buckling, a sandwich construction with fibrous glass ribbon filler was employed. The extra rigidity thus obtained permitted the stamping of functional louvers (for motor cooling) the full length of the hood. The hood itself rests on retaining edges that are molded directly into the sidewalls. The lock plate is molded directly into the hood.

To minimize vibration, the reinforced plastics body is mounted to the modified Jaguar chassis at only seven points, all of which are rubber-insulated. This type of asym-

metric mounting enables the car to be used as an occasional racer.

The formed acrylic canopy which serves as the top of the car rolls back on tracks into the teardrop-styled tail deck or can be rolled forward to give the effect of either an open or closed car. The mechanism of the retracting canopy is relatively simple and is based on the principles used in conventional sliding garage doors. Although it slides easily by hand on its nylon bearings, the roof is motor-equipped to permit operation from the driver's seat.

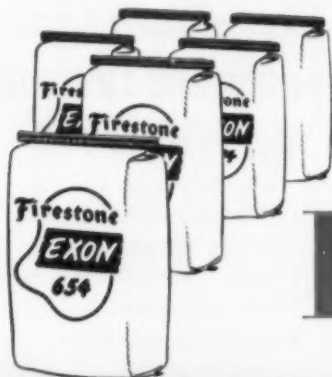
The simple, clean lines of the acrylic hardtop constituted one of the most difficult design problems encountered in styling the car, since its shape had to be such that it could serve as an enclosure yet would slide under the rear deck without encountering obstacles.

A special 30% transmission green acrylic (virtually opaque to ultraviolet and infra-red rays), 1/4 in. thick, was used for the canopy.

The complete Forerunner, standing 51 in. high and with a 100-in. wheelbase, weighs only 2100 pounds.

CREDITS: Forerunner body was built by the staff of William Flajole & Assoc., using fibrous glass materials supplied by Owens-Corning Fiberglas Co.; the acrylic canopy was made by Detroit Macoid Corp., Detroit, Mich., using Plexiglas supplied by Rohm & Haas Co.

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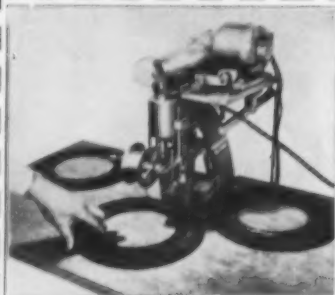
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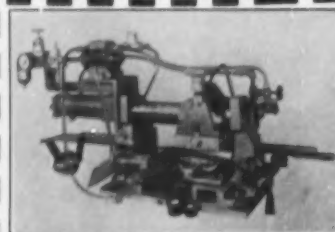
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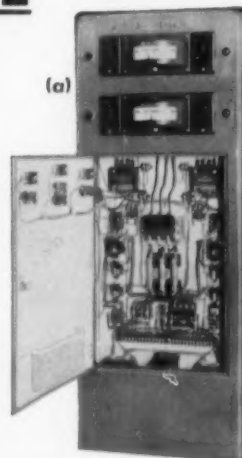
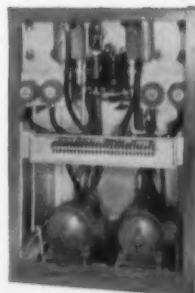
Eases the load of supervision. Large distant-view millivoltmeter Pyrometer Scales and Pilot Lights permit instant check on mold operating conditions. Cabinet (a) designed for location with other panel mounted Press Controls.

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Sizes to 51" x 108"

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Sprayed-on Roof

A HUGE poured concrete dome with a sprayed-on vinyl protective coating covers some 10,000 sq. ft. of unobstructed drill area for the National Guard armory at Lawton, Okla.

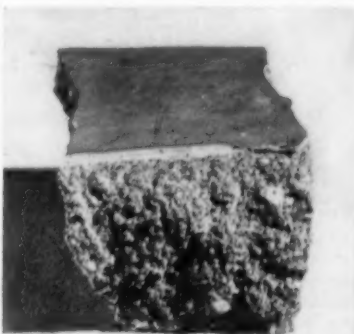
Applied at pressures of 100 p.s.i., the special solution of vinyl resins penetrates and fuses into the pores of the 4 in. thick concrete which forms the dome, thus providing protection against wind, weather, and abrasion. As additional coats are applied over the initial layer, a smooth, white reflective surface is built up that, gleaming in the sun, can be seen for miles around. This ability of the coating to reflect the sun's rays also contributes to cool under-roof temperatures.

The continuous and seamless vinyl membrane adheres strongly to the roof surface and, according to the manufacturers, can resist even severe hammer blows.

CREDITS: Based on vinyl resins supplied by Bakelite Co., Secoton Hi-Build vinyl coating used on the armory is marketed by Surface Engineering Co., Inc., Wichita, Kansas.



Protective vinyl coating sprayed on armory dome (above), penetrates and fuses into the concrete's pores (below)



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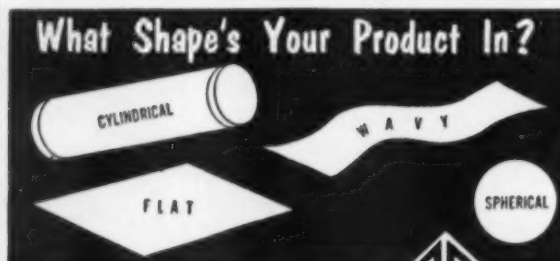
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Acrylic lid, with revolver molded in intaglio, and phenolic box make a handsome container for playing cards

Acrylic Lid

A COLORFUL molded acrylic lid and a black phenolic box add to the distinctive appearance of a playing card set being marketed as a business gift by Brown & Bigelow, St. Paul, Minn.

The set includes two decks of cards stored in individual pockets molded into the phenolic box. Pictured on the back of each of the cards in the two decks is a 16th century pistol.

This theme is continued in the design of the acrylic lid, which has an historic Colt's revolver molded in intaglio and decorated in gold and pearl. The area of the lid surrounding the gun is silk screened on the under-surface in a rich coral red. To contrast with the red tone of the lid, the phenolic box itself is finished in black.

Smooth surface, pleasant feel to the touch, attractive appearance, and a high degree of shatter resistance are some of the advantages resulting from the use of acrylic for the lid. Ease of moldability also gives the molder of the lid an opportunity to reproduce fine engraving details that are found on the revolver barrel and frame.

Secondary uses for the card set container include service as a jewel box or a cigarette box. The set, complete with lid, measures 7 $\frac{1}{2}$ by 4 $\frac{1}{2}$ in., and is 1 $\frac{1}{2}$ in. high.

CREDITS: Lid is molded for Brown & Bigelow by Hoosier Cardinal Corp., Evansville, Ind., using Plexiglas acrylic supplied by Rohm & Haas Co., Philadelphia, Pa.

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Included in the kit is: 1) a 110-v. welding gun with nozzle; 2) 15 ft. of nitrogen hose; 3) electrical connections; 4) a nitrogen flow-meter with tubing; 5) a contour marker; 6) a porosity spark tester; 7) marking crayons; and 8) a cutting-trimming knife.

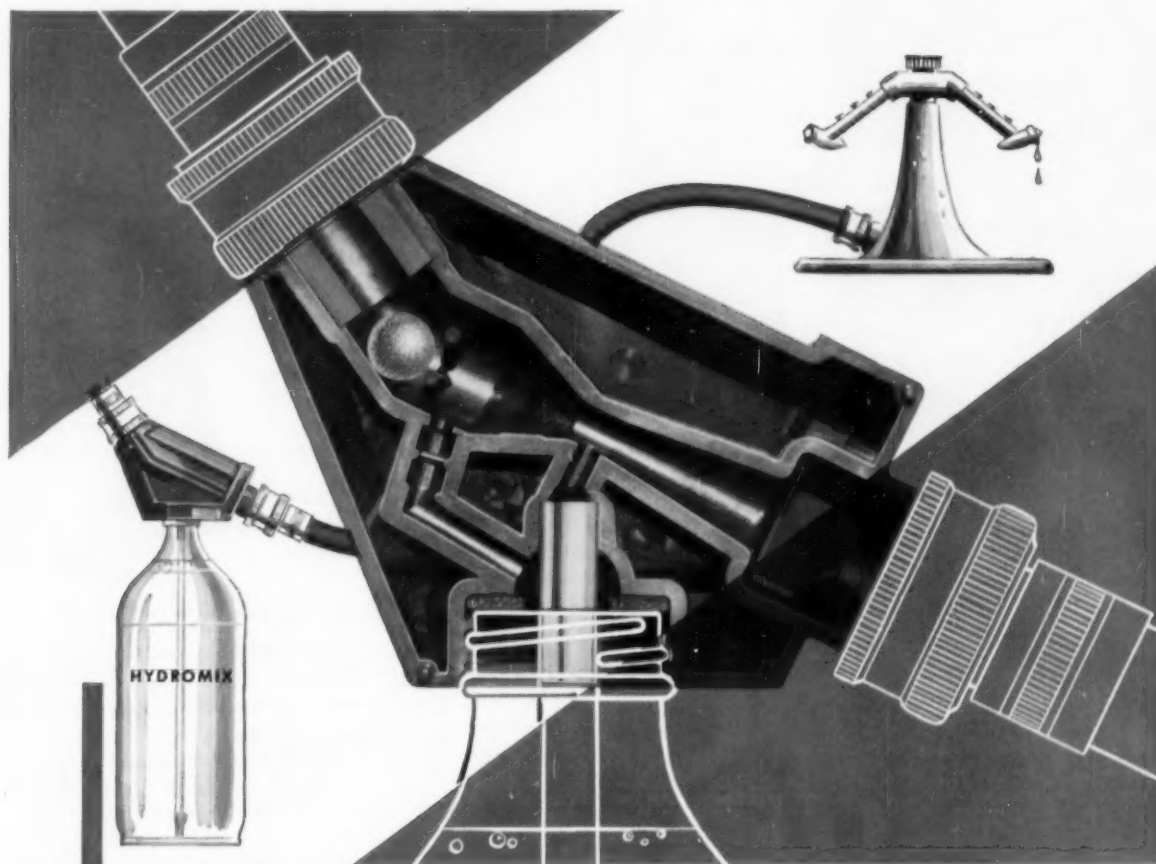
A special feature of the kit is the inclusion of two books on the subject of plastic welding written by outstanding authorities in the field. One book, "Welding of Plastics," by G. Haim and H. P. Zade, covers such topics as: the chemistry and physics of weldable plastics; hot-gas welding; heated tool welding; high-frequency welding; and seam welding machines. The other book, "Plastics Welding Manual," by G. Haim and J. A. Neumann, covers the subject of welding polyethylene and includes chapters on types of welds suitable for polyethylene; the layout for a workshop for the welding of plastics; and lining tanks with polyethylene.

The entire kit is available at a cost of \$150.

CREDITS: The Agile Hot Gas Welding Kit is available from American Agile Corp., Bedford, Ohio.



Kit for welding thermoplastics contains necessary tools and instructions



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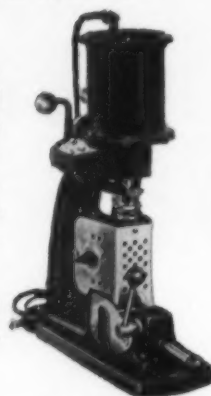
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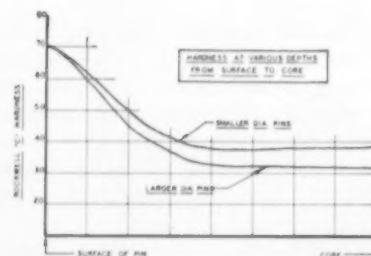
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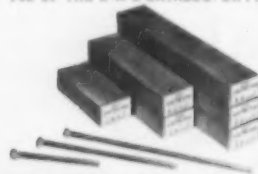
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Plastic Coating Applied Inside Pipe

MODERN equipment for applying an epoxy-phenolic coating to the inside of drill pipe and oil well tubing has been installed at the Ambridge, Pa. plant of Spang-Chalfant Div., The National Supply Co.

The coating is applied to the pipe to reduce failures caused by corrosion fatigue during drilling and is applied to tubing to reduce internal corrosion and to minimize the deposition of paraffines.

Prior to the development of the new equipment, the job of applying a protective coat to the inside of pipe smaller than 5 in. in diameter was a difficult one. The pipe had to be supported vertically, in which position it was filled with plastic, the plastic was allowed to drain off, and the coated pipe then baked in an oven.

With the new method, the pipe can be handled horizontally, permitting much greater speed and producing a more uniform coating. The pipe to be coated is first grit-blasted inside to remove all scales. The pipe is then degreased by immersion in an alkaline bath, followed by a hot-water rinse. It is next loaded on a buggy and rolled into an oven for preheating. The oven temperature is maintained at 375° F., but the pipes are removed when their temperature reaches about 160° F.

From the oven, the pipes are rolled, three at a time, into a position in line with the three spray lances that apply the coating. The lances, which are 35 ft. long and carry a 360° spray head, are ad-

vanced into the tubes and withdrawn from them at a uniform speed of 1 ft./sec., spraying both as they go in and as they come out.

At the inspection table to which the pipes are next rolled, the chamfer of each tube is coated, using a hand spray gun. Threads are masked during this operation. The tubes are then baked in an oven for a long enough time to bring their temperature to 375° F. They are held at that temperature for about 10 minutes.

Removed from the oven, the tubes are permitted to cool to the 160° F. spraying temperature, and are sprayed as before. The process is repeated until eight full passes, or 16 coats, of the coating have been applied. In the final baking, the tubes are heated to 420° F., and are held at that temperature for about 15 to 20 minutes.

From each load of pipe, a tube is selected at random and sent to the inspection department where it is checked for thickness and smoothness of the coating, adhesion, chamfer coating, and completeness of baking. The coating on pipe must have a minimum thickness of 0.005 inch.

Couplings get a minimum coating thickness of 0.025 inch. Each coupling is first masked off to limit the coating to the center threads of the coupling. Since these threads, known as the "J" distance, are not covered with pipe threads in the make-up joints, coating them does not impair the effectiveness of the coupling.

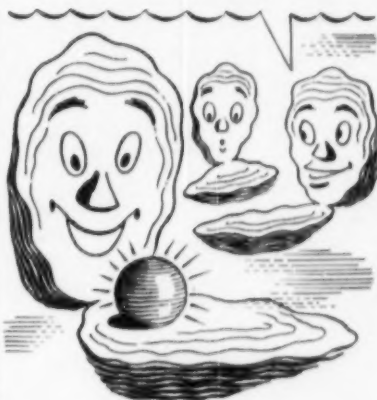


Spray lances advance into inside of pipe to apply epoxy-phenolic coating



Short spray lance is used on coupling; threads at either end are masked

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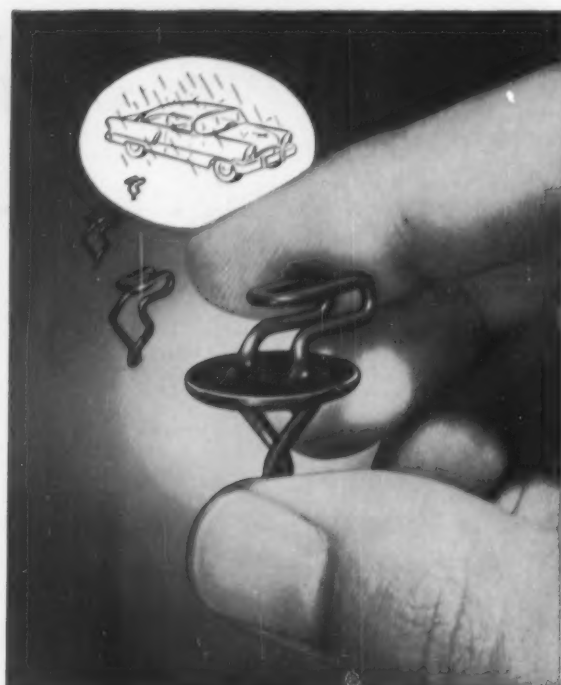
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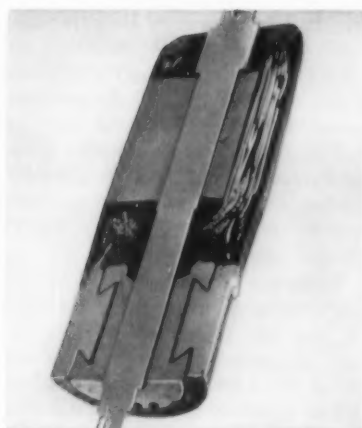
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Cutaway view of motor armature potted in epoxy resin shows windings and other parts held firmly in position

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CREDITS: Epoxy potting resins supplied by Bakelite Co.; the armature is manufactured by McCulloch Motors Corp., Los Angeles, Calif.

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Polyethylene

(From pp. 85-92)

greater flexibility and more nearly approaching conventional high-pressure polyethylene.

Koppers Co., Inc., first producer in the United States to announce production of Ziegler-type polyethylene, had a pilot plant in production from last November until June, producing several hundred pounds per day. A much larger plant came into production at Kobuta, Pa., in June. In September there will be a 500% increase over June, and in the first quarter of 1956 that production at Kobuta will again be increased by 500 percent. It is assumed that a much larger plant will be started soon. Koppers feels that it is out in front on volume and facilities for its high-modulus Super Dylan polyethylene and expects to stay there. It is also important to note that the Koppers high-pressure polyethylene plant will come into production at Port Arthur, Texas, in August. Capacity is around 30 million pounds.

Koppers' present low-pressure material is Super Dylan 6200. It is an easy flow, injection molding grade. After that has been established, there will be Super Dylan 6400 with a higher stiffness modulus, which means higher tensile or resistance to stretch. It will also have a higher impact strength and a lower melt index or plastic flow. After that, there will be others, each with higher properties and a lower melt index.

Melt index is a measure of plastic flow under certain specific standard conditions. The lower the index, the harder the material. A melt index of 0.2 is relatively hard, while 20 is soft.

Du Pont, which will have samples of Ziegler-type polyethylene from a pilot plant early this fall, has no comment concerning report that it expected to increase production facilities of high-pressure polyethylene by 100 million pounds.

Bakelite Co., a Div. of Union Carbide and Carbon Corp. indicates that its Ziegler-type polyethylene will soon be sampled by the trade in a form that the company is reasonably sure can be duplicated in a large-scale commercial plant. Plans for such a plant in the United States

are still in abeyance. Reports have been printed that the Union Carbide Canadian subsidiary will break ground soon for a high-pressure plant at Montreal East, Canada.

The Bakelite high-pressure plant at Torrance, Calif., is coming in next spring with the originally planned annual production capacity of 60 million pounds.

Monsanto Chemical Co. has a high-pressure plant in production. It also has a Ziegler privilege to use his patents. In addition, Monsanto has a low-pressure pilot plant which is working on a material that its research department has been developing over a long period of years. No announcement has been made as to when this pilot plant will be ready for production.

Hercules Powder Co., Inc. was probably the first American company to smell out what Prof. Dr. Ziegler was doing with his new catalysts. An announcement that Hercules has a low-pressure polyethylene pilot plant in production should be forthcoming any day. It is also in a position to manufacture a form of the Ziegler catalysts in the United States for firms that have a Ziegler license. These catalysts can be used for the previously mentioned new method of polymerizing addition polymers, such as vinyls, styrene, propylene, and for use with olefins, alcohols, oxo chemicals, and many other chemicals.

Goodrich-Gulf, a combination of B. F. Goodrich Co. and Gulf Oil, were also on the ground early, obtaining a Ziegler license in mid-1954. The company has sampled the trade with low-pressure polyethylene but to-date has made no announcement concerning progress that has been made so far.

The Dow Chemical Co. has received a Ziegler license and is evaluating possibilities for the new material. Its new high-pressure plant with an estimated capacity of 30 million lb. a year is now in production at Freeport, Texas. Initially, two formulations are available, one for injection molding and the other for pipe extrusion. Formulations will soon be available for film extrusion, blown bottles, wire coating, and paper coating.

U.S.I. reportedly has a contract for a look-see with Ziegler but is not known to have taken out a license. The company is now in pro-

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OP.13

duction of high-pressure material at its Tuscola, Ill., plant. Capacity is reported to be around 30 million lb. a year.

Eastman Chemical Products, Inc. is now producing all grades of high-pressure polyethylene, including film grade. Capacity is thought to be well over the originally estimated 20 million pounds. New melt-index 20 material, notable for mold finish, has aroused considerable interest. The company does not have a Ziegler license but is exploring several approaches toward production of low-pressure material if evaluation of market indicates the need. The company also has a low molecular weight polyethylene on the market for paper treatment. Don't be surprised if Eastman Chemical pulls another surprise in low-pressure polyethylene, just as it did not too many months ago when it announced its entry into the high-pressure polyethylene field.

Spencer Chemical Co. has been producing a molding grade material since last April. It expects to have film and electrical grades by Sept. 1. The company asserts that it will

have low-pressure material if the market develops to a substantial proportion. Capacity of present high-pressure plant is designed for 45 million pounds.

W. R. Grace & Co. has signed a license agreement with Phillips Petroleum Co. which includes use of the process, patent rights, and the company's technical knowledge for production of Phillips' type of polyethylene. The project involves an investment of over \$18 million. No plant site has been chosen as yet. Construction is scheduled to start during the first half of 1956, with the plant going on stream in the first half of 1957.

Allied Chemical & Dye Corp.'s Solvay Div. is producing low molecular weight polyethylene for waxes, paper treatment, etc. It has made no announcement concerning either high- or low-pressure polyethylene but is considered a likely prospect to get into the field.

There may be several other firms in the United States who have contracts with Ziegler, but not necessarily a license. Enjay and perhaps a number of other petroleum com-

panies are likely to be found on a list of that sort.

Activity Abroad

Farbwerke Hoechst A.G. of Frankfurt, Germany, was the first company to go to work on Ziegler's low-pressure polyethylene. The company has been producing low-pressure polyethylene in a pilot plant for several months. The trade name is Hostalen. A new commercial plant is now under construction, which will begin operations with production of from 60,000 to 600,000 lb. a month with plans for eventual production of 2 million lb. a month. This new plant will not come into production until late 1955 or some time in 1956, depending on availability of ethylene.

Ethylene is a scarce and expensive product in Germany. To help remedy this situation, Hoechst has developed a cracking process, starting from crude oil, to produce lower olefins—mostly ethylene. The company hopes to have this plant completed some time in 1956. A cost price has not yet been determined.

Reports that polyethylene of any

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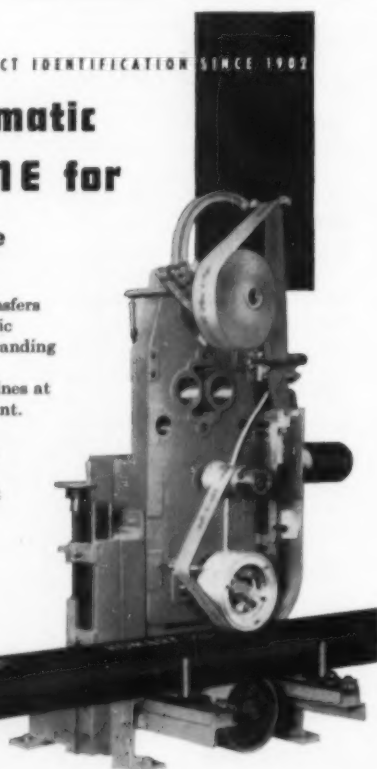
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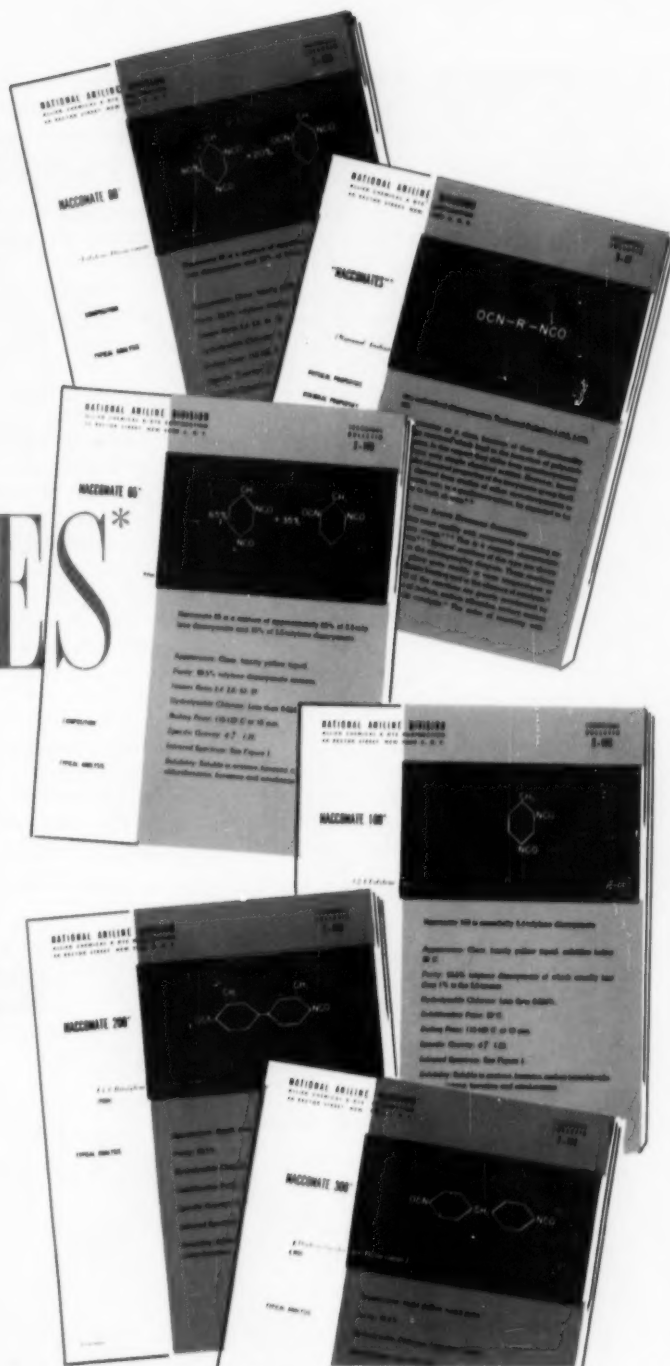
Bulletin I-17C—NACCONATE 100 gives corresponding product data on National's 2,4-tolylene diisocyanate.

Bulletin I-17D—NACCONATE 200 covers National's 3,3'-bitolylene 4,4'-diisocyanate.

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type will be lower cost in Europe than in America seem to be in error. German high-pressure polyethylene is presently about 50¢ a pound. Petroleum and ethylene are more costly in Europe than in America. Chemical labor receives 54 to 60¢ an hour, which is much less than American chemical workers get, but most of the difference is absorbed in payments to a huge German social fund, high taxes, and an obligation to provide housing for company workers.

Mannesmann, a Ruhr steel combine, Deutsche-erdoel, an oil company, and Hoechst will jointly build a plant to produce about 50 million lb. of low-pressure polyethylene annually. Mannesmann is one of the largest pipe producers in Europe and most of the polyethylene output is expected to be used for that purpose. The joint enterprise, to be known as Coal-Oil Chemistry (Kohle-Oel Chemie), will be located at Gelsenkirchen on the Rhein-Herne Canal.

Working Group Olefin Chemistry in the Ruhr is a joint venture of several German coal mining companies which have also received Ziegler

rights, according to press reports. Chemische Werke Hüls A.G., a synthetic rubber plant at Marl near Recklinghausen, is also reported to have a Ziegler license.

Ruhrchemie and Hibernia are two more German companies in the Ruhr which have pilot plants working on low-pressure polyethylene.

Rheinische Olefinwerke at Wesseling/Rhein, Germany, a joint company with Badische and Shell Oil, will have a high-pressure plant with a capacity of about 20 million lb. a year on stream in October.

Badische Anilin also has a plant at Ludwigshafen in production on high-pressure polyethylene of a few million lb. annual capacity.

Shell Oil has purchased the Petrochemicals Co. in England and is reported to have an exclusive contract with Ziegler for production of low-pressure polyethylene there.

Canadian Industries, Ltd. of Montreal has a 25 million-lb. per year plant for high-pressure polyethylene at Edmonton, estimated enough to supply the Canadian market for 1½ or 2 years. Canadian Industries, Ltd. now supplies half the Canadian mar-

ket but is gaining percentage-wise. Practically all the imported material comes from the United States. Consumption of polyethylene by end use follows almost exactly the same pattern as in the United States, which is contrary to reports that the largest portion is for pipe. The company has no concrete plans to produce Ziegler material, although the situation is being actively studied.

Imperial Chemical Industries of London, England, the original producer of high-pressure polyethylene and licensor to American companies who are producing it, now has a plant capacity of 50 million lb. a year. It will have capacity of 70 million lb. before the end of 1955 and 110 million lb. by the end of 1956. The company's licensees in Europe are Ethylene Plastique in France, Montecatini in Italy, and Badische Anilin in Germany. The company has made no statement on any plans for low-pressure polyethylene.

• • •

NEXT MONTH: A detailed review of what has happened to high-pressure polyethylene during the past year.

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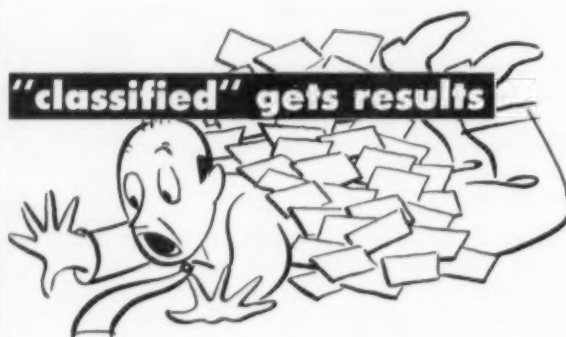
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- Coil Forms
- Connectors
- Gears, Insulators
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- Rollers, Valve Seats
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Let us make test samples of your parts from Sinko NYLON or other Thermo-plastic; or if you prefer, we'll send you the raw material.

Sinko MANUFACTURING & TOOL CO.

2127 W. GRAND AVENUE • CHICAGO 22, ILLINOIS





There's always been a lively market for used plastics processing equipment. At this moment, it is probably more active than at any time since 1950. One of the prime movers of this "second hand—first quality" machinery is the Classified Advertising Department of Modern Plastics.

"Classified" rates, for either buyers or sellers, are very reasonable. Check them now, on page 272 of this issue.

Classified Advertising Department

MODERN PLASTICS

575 Madison Avenue

New York 22, N.Y.

ABBOTT'S *New* PLASTIC DIE PRESS

for TRIMMING formed plastic sheets

Safety, — Accessibility, — Control, — means no down time for maintenance, and smooth trouble free performance.

With an Abbott Plastic Die Press you are assured of greater savings, — low initial cost, — low die costs, — and low production costs.

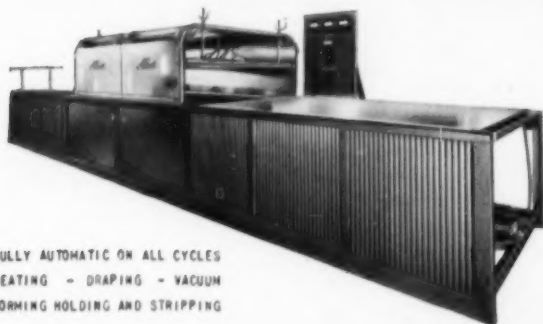
All these features can only be possible thru Abbott's efficient design, good materials and excellent workmanship.

FEATURING

- 14 inch daylight opening, (a plastic part drawn 14" deep can be cut without moving die).
- Stroke is adjustable from 1" to 14" platen opening.
- Platens are 36"x36" or 9 sq. ft. cutting area.
- Press designed to cut 500 lin. in. of .100 thickness material at rated 60 tons pressure. (Thinner material in direct proportion.)
- Lower platen is adjustable at 3" intervals.
- All bearings are super-oxide for high stress.
- Controls are all air operated with complete safety features to protect operator.
- Designed for use of simple steel rule dies.
- Pneumatic cylinder operates compound toggles for simple trouble free fast operation.
- Simplified construction, accurate machining in a steel frame.

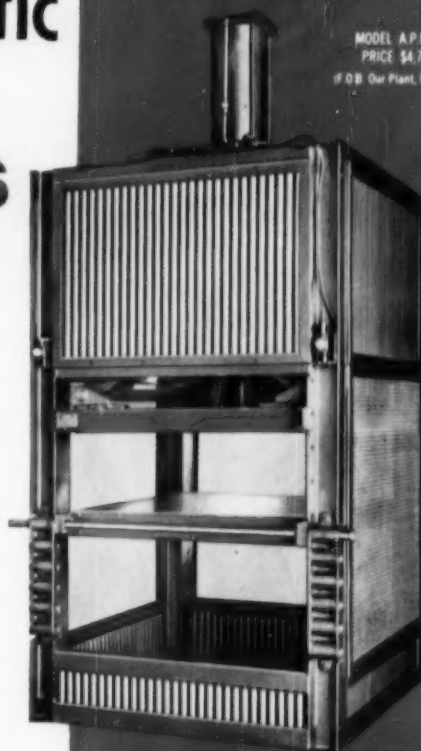
you can't sell a formed plastic

*sheet without
TRIMMING IT!*



FULLY AUTOMATIC ON ALL CYCLES
HEATING - DRAPING - VACUUM
FORMING HOLDING AND STRIPPING

— NEW PLASTIC FORMING MACHINE —



14" STROKE (COMPOUND TOGGLES)
60 TON PRESSURE - 36" x 36"
PLATEN AREA - FULL SAFETY FEATURES

MODEL A.P.M. P36
PRICE \$4,700.00
(F.O.B. Our Plant, Chicago, Ill.)

THE POTENTIAL IN THIS FIELD IS BOUNDLESS

Abbott engineers introduced a new method of skin-packaging using very thin plastic film, formed directly over your product and sealed on a printed cardboard back. A perfect package or display and at the lowest cost possible.

We invite your inspection of a demonstration of our equipment at our Display Rooms. If that is impossible, additional information will be furnished at your request.

GENERAL SPECIFICATIONS FOR ABBOTT PLASTIC DIE PRESS

| MODEL | FLOOR AREA | CYLINDER | MAX. PLATEN STROKE | AIR PRESS. P.S.I. | APPROX. SHIPPING WEIGHT |
|---------|-------------|----------|--------------------|-------------------|-------------------------|
| APM P36 | 6'0" x 4'0" | 8" DIA. | 14" | 100 TO 150 | 7,000 LBS. |

The 4 Abbott Models

ALL TWO-STATION Units

| MODEL NO. | SIZE | PRICE |
|-----------|-----------|------------|
| APM 30 | 30" x 30" | \$2,480.00 |
| APM 40 | 40" x 40" | 3,680.00 |
| APM 60 | 60" x 60" | 7,400.00 |
| APM 90 | 90" x 90" | 9,480.00 |

Prices F.O.B. Our Plant, Chicago, Ill.
Weights not included.

ABBOTT PLASTIC MACHINE CORP.

Sales Offices: 6322 North Clark Street, CHICAGO 26, ILLINOIS

For The Security Of Experience, Insist On ABBOTT

Guaranteed to be the Highest Production Vacuum Forming Machines on the Market

ABBOTT'S 2 Working Tables Afford DOUBLE Capacity

HAVE YOU FULL INFORMATION ON



Many things heretofore considered impossible or uneconomical can be done with this comparatively new method, called ELECTROFORMING. Electro-deposition of metal on a master form (which may be of almost any material that will withstand a mild acid, and 110° temperature) is the secret.

This means that the mold is made in the greatest detail, with complete accuracy, reproducing the finest texture, and making possible under cut cavities: ELECTROFORMING differs from all other mold-making methods in one important way—it is GENTLE.

No great pressures, no high temperatures and no heat treating that may cause distortion. ELECTROFORMED cavities are best for chemical resistance (not stained by Vinyls or Fluoride Plastics) and for delicate cavity detail, such as tiny holes, slots, etc.

WRITE for further
information, or
SEND FOR BULLETIN

ELECTROMOLD CORP.

140 ENTERPRISE AVE.

TRENTON, N. J.

NO STRESS



NO PRESSURE



NO HIGH TEMPERATURE



NO DISTORTION



Disneyland

(From pp. 93-96)

vacuum forming various components of the Disneyland displays. They include, in addition to impact styrene, clear transparent and vacuum metallized cellulose acetate and cellulose acetate butyrate, rigid vinyl, and acrylic. The last is used for such applications as a space helmet in one of the displays, where a fairly thick and transparent material is required. Thicknesses involved range from 0.010 to 0.125 in., depending upon the depth of draw and other factors.

Stensgaard's large new vacuum forming machine, used in producing the bulk of the Disneyland displays, cycles automatically after the set-up has been made. Built-in timers control the forming and cooling periods and the operators working at each of the two platens need only to place the plastic sheets in position and to remove them at the end of the cycle. Cooling time is cut to a minimum through the use of a power blower system. Individual blowers are mounted at each end of the machine. They pick up cool air at the floor level and distribute it over the formed sheets at high velocity through slotted vents.

In figuring molding cycles for vacuum formed display units and other parts, Stensgaard follows a "rule of thumb" calling for approximately 1 sec. of vacuum for each mil (0.001 in.) of material thickness. Thus, the vacuum cycle for a sheet of plastic 12 mils thick will run approximately 12 seconds. The forming machine is first set up on this basis, and the cycle then gradually reduced, if feasible, to obtain the shortest possible forming interval consistent with high quality parts. The cooling period required before the formed sheet can be stripped from the mold is reduced about one-half by the blower arrangement.

Trimming Problem Solved

Since many of the parts for the Disneyland project and other display programs are intricate in outline, a major production problem is that of cutting the finished parts from the sheets after forming. Steel rule dies would involve considerable time and expense. Bandsawing the individual parts from the sheets would also be time-consuming, and would be out

of the question for some types of displays because of their intricate outlines and inaccessible inner portions which must be cut out.

Stensgaard's ingenious solution to this problem is to turn the formed sheet on edge, place it against a smooth vertical surface, and pass it through a band saw which is set to clear the vertical surface by the thickness of the sheet. Thus the formed parts are separated cleanly, in one operation, from the plastic sheet regardless of the intricacy of the design of the parts. Even complicated center cut-outs may be handled by this method with a single pass through the band saw, as illustrated by an animal cage in the Casey Jones Jr. Disneyland train display which has a number of parallel openings separated only by slender bars.

The technique works equally well on large single parts or on multicavity jobs having a number of parts, since allowance is made for the trimming operation in the design of the molds. The success of this cut-out method hinges largely on the fact that most of the pieces to be trimmed are essentially "silhouettes in relief," having a relatively shallow draft (with certain exceptions) and a back edge which all lie in a single plane.

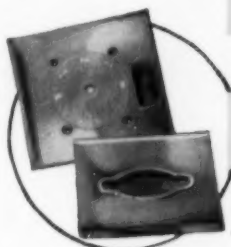
A number of the larger units of the new Disneyland displays are constructed by assembling or overlapping two or more individually formed components. This technique was used in creating a 12-ft. rocket ship model which features a moving elevator, small "passengers" placed at different levels, boarding platforms, and a sequence of lighting in different parts of the ship to represent various phases of operation. "Full-round" figures of Dumbo the flying elephant are made by joining two vacuum formed halves, using a lightweight interior bulkhead which facilitates assembly and gives the finished piece increased strength. One main wall section of an enchanted castle display measures approximately 33 by 64 in. in size; when fully set up for store use, this complete display is approximately 15 ft. from end to end.

Styrene Foam Parts

Although vacuum formed sheet plastics dominate the new Stensgaard Disneyland exhibits, the pro-



Spray Painting Machines
for every requirement



Automatic Paint Wipers
far faster than hand wiping

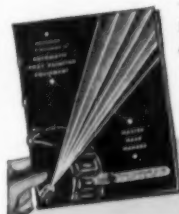
Pressure-Formed Spray Masks
for easier, faster spraying and quicker cleaning



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**Look what Liberty's
Electric Unit can do for you**

★ ★ ★

EMBOSES LAMINATES POLISHES

A single unit to emboss, polish and laminate vinyl and it can't be beat. Why? Because it operates by electricity, and that means clean, uniform and controllable production. Here's what this tested unit means to you:

Increased production: the unit is designed for non-stop operation having dual let-off and take-up stands; runs at 6-42 yards per minute

Customers claim up to 35% in yardage without loss of width; chrome and engraved rolls are internally cooled

Superior performance: pressure is infinitely adjustable to suit roll being used; air pneumatic pistons individually controlled

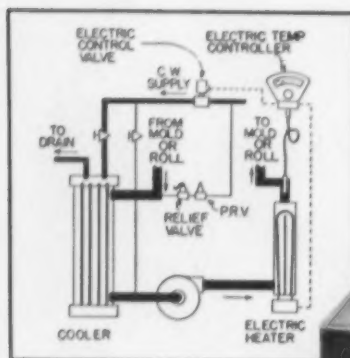
Reg. U.S. Pat. Office

This Liberty Combined Embossing-Polishing and Laminating, for all gauges of vinyl, has an operating face of 62". Handles widths up to 60".



LIBERTY MACHINE CO. INC.

Get complete details by writing Liberty Machine Co., Inc., 275 Fourth Ave., Paterson 4, N. J.



Schematic sketch of the control circuit in the Sarcotrol Model MC-1, Single Unit. Model MC-2, Dual Unit, is equipped with two of these circuits, MC-3 has 3 circuits.



Before you buy...Compare all Temperature Control Units for molds, rolls, cylinders, drums

COMpletely redesigned, the new Sarcotrol heating and cooling unit is fully automatic as shown in the following list of features. It maintains even face temperatures by recirculating temperature-controlled water at high velocity through molds or roll jackets. Check Sarcotrol's features against any other unit *before* you buy.

Sarcotrol gives you all these features

- ✓ **Dependability** — built and guaranteed by Sarco, makers of temperature controls and steam traps since 1914.
- ✓ **No need for special heat transfer liquids** — temperature-controlled water to 300° F. is recirculated at high velocity in closed system.
- ✓ **Independent circulating systems** — the Sarcotrol is available with one, two or three independent systems (see above sketch).
- ✓ **Simple, sensitive control** — one knob changes temperature control setting; sensitive thermostat ($\pm 1^\circ$) minimizes temperature lags; easy-to-read dial shows both desired and actual temperatures.
- ✓ **Automatic selection of heating rate** — for fast heat-up; then close control.
- ✓ **Saves electricity and water** — the same thermostat regulates both rate of heat input and cooling; cuts out both when set temperature is reached.
- ✓ **Automatic heater protection** — heaters are automatically cut off when pump is shut down.
- ✓ **Many other features** — are listed in the Sarcotrol technical bulletin.

2081 F

SARCO

Improves product quality and output

Please advise if you are interested in automatic temperature control for molds or for rolls. Technical bulletin and case histories will be mailed to you by Sarco Company, Inc., Empire State Building, New York 1, N. Y.

gram also makes extensive and effective use of Crystofoam (polystyrene foam) for such massive figures as the whale in the Pinocchio exhibit, constructed in several movable sections for motorized action, and the 8-ft. Dumbo figure, finished in striking pink and mounted on an elevated revolving support. This display is sufficiently large for a full-size adult mannequin to be seated on the elephant's back for an arresting display of lingerie or other apparel.

These and other large styrene foam figures are carved directly from blocks of the plastic material, then covered with a protective layer of Celastic which gives them a smooth surface that may be finished in any desired color. Celastic is a colloid-treated fabric which adheres tightly to the surface of the plastic foam, conforms faithfully to contour details, and dries to a smooth, hard finish.

Smaller full-round objects in the Disneyland display, such as Mickey Mouse heads, are also carved from solid blocks of foamed styrene, using a multiple-spindle carving machine capable of turning out as many as 18 duplicate parts simultaneously as the master control is passed over the original wooden model at the center of the unit. In the final finishing operation, these heads are covered with a layer of special paper which is applied in small sections, using a paste-type adhesive. This covering dries to a smooth, uniform surface which is then painted as required.

By taking advantage of the latest in plastics production techniques, and by coordinating in one plant such greatly differing processes as vacuum forming, casting, and machining with wood carving and clay modeling, Stensgaard has come up with a dramatic result. The "Disneyland in Miniature" merchandising displays should entrench plastics even more firmly in the field.

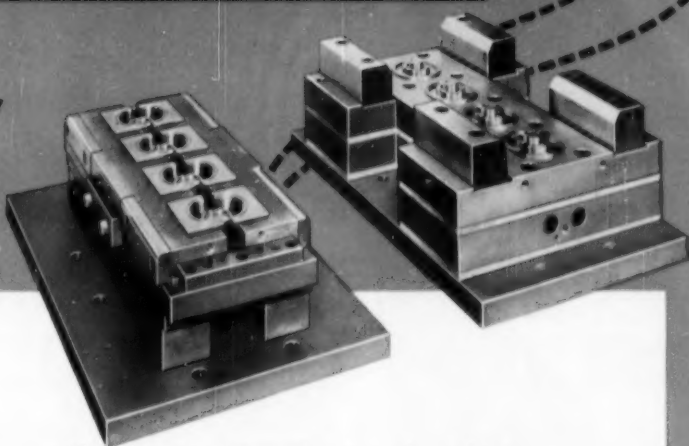
CREDITS: APM Model 90 sheet forming machine: Abbot Plastic & Machine Corp., Chicago, Ill. Plastic materials for sheet forming: Eastman Chemical Products, Inc., Kingsport, Tenn.; The Dow Chemical Co., Midland, Michigan; Rohm & Haas Co., Philadelphia, Pa.; Coating Products, Englewood, N. J.; and Gomar Mfg. Co., Inc., Newark, N. J. Expanded styrene: The Dow Chemical Co. Celastic: Celastic Corp., Arlington, N. J. Phenolic casting resin for molds: American Resin Corp., Chicago, Ill.

Cascade

pre-hardened mold steel

used by
Guest Machine Co.,
Huntington, Ind.

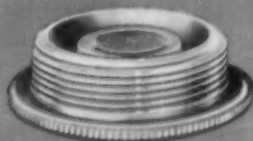
for this plastic mold →



because...

1. "Prehardened Cascade gave uniform hardness throughout . . . important since this is a segmented mold."
2. "Cascade required only one fitting of parts . . . no heat treating necessary that might cause size change."
3. "An excellent finish was easily obtained on Cascade . . . important because threaded portions of finished part required a smooth surface."

The mold shown above was made by Guest Machine Company for the Rieke Metal Products Corporation, Auburn, Indiana. This unit is used for injection molding $\frac{3}{4}$ " and 2" polyethylene plugs for steel containers. Pictured is a 2" plug.



The comments about Cascade's outstanding qualities, made by the Guest Machine Co., are typical of the comments from many moldmakers everywhere.

Uniformity of hardness—a direct result of Cascade's precipitation hardening property—together with excellent weldability and outstanding polishing characteristics make Cascade the ideal prehardened steel for high quality molds.

Order prehardened Cascade for your next mold—large stock available from conveniently located warehouses.

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RC PLASTICIZER
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THE JOB
BEST!**



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natural rubbers, **TRY...**

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HINGES... **for PLASTIC BOXES**

press-fit assembly

(Holds like

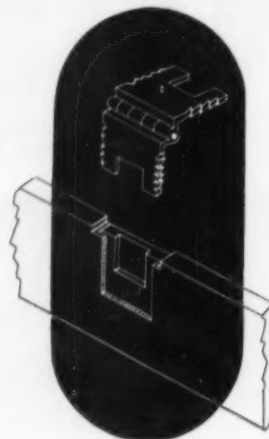
a drive-screw)

with

or without

double action

"C" Springs



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... provide null balance measuring accuracy with elec-
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controlled accurately and automatically. The two-posi-
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SADDLE RIVER TOWNSHIP, Rochelle Park P.O., NEW JERSEY
CANADA • THERMO ELECTRIC (Canada) Ltd., BRAMPTON, ONT.

Exposition

(From page 113)

vinyl sheet materials were seen in a number of novel applications, including a tote box made from a laminate of rigid (on the inside) and flexible (on the outside) vinyl sheeting.

As was anticipated, polyethylene made an excellent showing at the exhibition, not only in the form of housewares and household accessories, but also in the molding of parts for such industries as the plumbing, radio, and surgical fields.

Phenolic and urea materials were very much in evidence. Examples of their application in foundry work for shell molding were on show. Melamine also appeared in the form of dinnerware and as a raw material to be used in paper-making. And the polyester and epoxy resins, as used for casting, encapsulating, and in the bonding of fibrous glass materials, received enthusiastic attention.

Nylon applications were not as prominent in this exhibition as they were in 1953, but some colored nylon moldings were shown. And appearing for the first time at a British Plastics Exhibition was metallized cellulose acetate sheet for use in packaging, for displays, and for dress sequins.

Machinery and Equipment

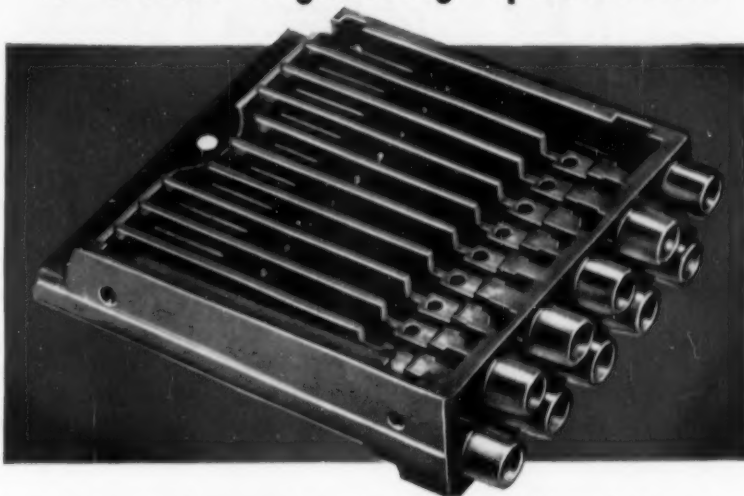
The section of the exhibition in which new machines and equipment were shown also proved exceptionally popular. In general, a study of the various units on display revealed one important trend in machine design in England—an intensification in the development of fully automatic equipment both in molding and in coating and finishing.

The British Plastics Convention which was held in conjunction with the Exhibition drew a record average attendance of 310 persons per session. In 1953, the average attendance was 284.

Included among the 20 technical papers given at the Convention sessions were reports on the synthesis of new types of addition polymers, irradiated materials, foamed plastics, new nylon polymers and compositions, single-screw thermoplastic extruders, foundry applications, reinforced plastics, and epoxies.—END

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to critical engineering specifications

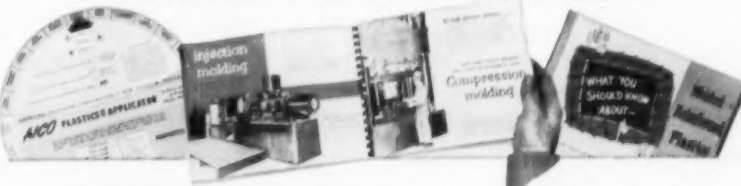


American Insulator specializes in molding precision plastic parts that reduce final assembling and finishing costs for manufacturers.

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AICO PLASTICS APPLICATOR . . . tells at a glance which plastic is best suited for your product, and how it should be molded.

AICO FACILITIES BOOK . . . describes equipment needed to provide a complete molding service. A valuable guide

to selecting a single, fully-equipped molder. Tells how to avoid annoyance and waste of split responsibilities.

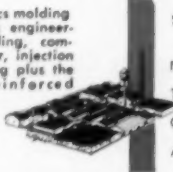
REINFORCED PLASTICS BOOK . . . tells all about these amazing new materials that are strong as steel—light as aluminum.

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A complete plastics molding service including engineering, mold building, compression, transfer, injection and cold molding plus the molding of reinforced fiberglass.



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Top management men will recognize at once how this new organization can help them to chart profitable new areas of operations in the fast-moving, fast-growing plastics field.

Background Facts. More and more companies are investigating plastics with an eye to developing new product lines, new sales outlets, new and promising openings for capital investment. The reasons make sense: plastics are still new and a constantly growing family of basic manufacturing materials, that are tied to many growth industries and to a host of vital product applications.

Nevertheless, the prudent executive charged with the shaping of company policy does not proceed rashly. He knows that the plastics field is complex. To steer his company on a knowledgeable course calls for informed and highly specialized research by experts who *know* the plastics field. *Modern Plastics Research Corporation provides just this kind of service.*

What the Company Is. The firm is unique in the field of business research. Its expertness in the field of plastics is unmatched. The staff is composed of specialists in all facets of the subject: present and potential applications, trends and developments in materials and technology, marketing and merchandising, financing and administration.

Moreover—and most significantly—the firm is directly affiliated with *Modern Plastics magazine*. It has full recourse to the accumulated experience, background and knowledge of that publication.

How to Use Its Services. If you are currently looking for a fresh approach to your own program of company expansion—or if you feel the need for thoroughly researched facts concerning your current operations—then you should arrange *now* for a preliminary consultation with a principal of this company.

Such a meeting places you under *no obligation*—yet enables you to evaluate *in advance* the value that a full analysis can bring to your company.

*All communications and inquiries
held in strictest confidence.*

MODERN PLASTICS RESEARCH CORPORATION

575 Madison Avenue New York 22

Molded Label

(From pp. 102-103)

inserts merit special mention. As one of the photographs shows, the band is forced out of the mold by knockout pins as the mold is opened, but the hooks are still retained by the mold undercuts in three of the pins. All the operator has to do is to slip the hooks out of the undercuts and remove the band from the machine. The slots with which the hooks engage are simply open areas in the molded piece.

Surface Finish

Important to the customer was an over-all reproduction of the metal band that had so long been an identifying label. The plastic band had to have at least as good an appearance as the metal band and, to survive, had to improve on the original. It was early established that available metallic butyrate materials would not meet the customer's requirements. Therefore, a metallic lacquer was developed which, when sprayed on the surface of a clear butyrate molding, would give the required color.

Mold Design Problems

When the methods of solving problems of locking the molded label in place and the method of arriving at a suitable color finish had been determined, the molder went to work on the mold.

Photostats of the metal band were made and translated into engraved Plexiglas acrylic sheets which were set up in a pantograph machine. From these acrylic templates the mold was engraved to a depth varying from 0.080 in. to as little as 0.020 inch. Detail was held in the more intricate parts of the original design by a compromise between delicacy of engraving and open areas.

Provision for free flow of material to all parts of an injection mold is a must in mold making. In the case of the liqueur bottle label, the problem was complicated by the large area of the piece—15¾ in. long by 4 in. wide—the large number of open areas, and the thin and varying sections demanded by the design. For example, the band is 0.060 in. thick plus the approximate 0.020-in. height of the decorative balls, the letters are 0.040 in. thick, and the

Our Faith In The Future of Polyethylene...

...began to exert itself way back in 1946. At that time we were almost considered to be theoretical in that our approach to plastics was based on the future of Polyethylene.

Today, or shall we say millions of pounds later, we at American Agile are still devoting our energies and facilities to better processing and fabricating of Polyethylene materials.

With Polyethylene on the threshold of becoming the most universal of all plastics materials in use and application we believe our years of experience and know-how in answering the most difficult processing problems can be of great value to you in your future use of this fabulous plastics material. We will be glad to give you the benefit of our thinking and our facilities in solving your individual problem.

Fabricators and Processors of Polyethylene—for Industry

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- 5461 Dunham Road •
- Maple Heights, Ohio •



Exclusive **SEALOMATIC** 3 kilowatt electronic heat sealer with 133% power capacity!

Sealomatic introduces a really new design in electronic heat sealers—a 3kw sealer that uses a 4kw tube to give you plenty of reserve power! Simplified design permits an unskilled operator, with a push of two buttons, to produce strong seals, clean precision cuts, and good-looking embossings.

A SEALOMATIC EXCLUSIVE ►

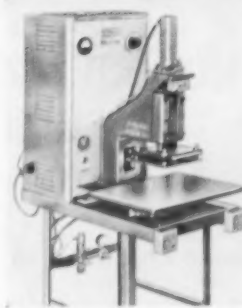
ARC-GUARD* is an exclusive synchronized safety device that protects costly dies and tubes from arcing damage with a built-in arc suppressor. ARC-GUARD acts instantly to prevent burning and scarring. And it's never necessary to tune this remarkable arc suppressor—it automatically tunes itself to any die without complicated adjustments.

We also offer the ARC-GUARD as an attachment for use with ANY brand of heat sealer.

Check these SEALOMATIC 3kw advantages:

- No tube failure . . . plenty of reserve power (output tube actual rating is 4kw)
- Fast, full timing control
- Simple, safe "one-knob" power control
- Dies changed in only a minute
- Dies protected by the exclusive ARC-GUARD

ARC
GUARD



Model 300-5825 . . . a compact, 3 kilowatt sealer of a price similar to lower-powered machines.

If you weld, cut or emboss flexible and rigid vinyl, you can cut costs and increase production by using a SEALOMATIC sealer, made with top-quality components. Models from ½ to 25 kilowatt in stock. Custom units developed to match your specifications. SEALOMATIC also offers a new-design turntable with a precision positioning feature. And you can always be sure of low prices and fast deliveries. Write or phone for our catalog and additional details. Be sure to ask about our free trial offer.

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FASTER! from

MELAMINE DINNER WARE with this

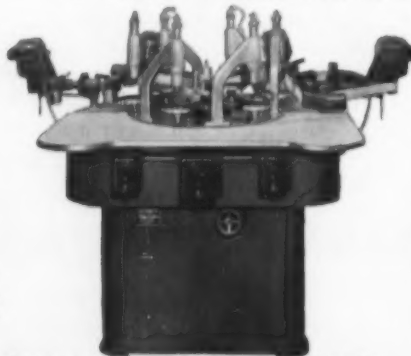
NASH 116 ROTARY EDGER

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- ★ 3" to 11" Dia. Mouldings—

- ★ 12 to 36 Pieces Per Minute—
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filigree work is 0.020 in. thick. Engraving was done with a special "V" type pantograph cutter which would give the greatest flow area in the back of the piece while retaining the detail demanded on the front. To the same end, in places where the wall between two designs became thin, they were removed wherever this could be done without detracting from the over-all appearance of the piece.

When the mold was first built, two gates were provided at points near the crowns in the band. The mold filled out satisfactorily but it was thought that molding pressure could be reduced if four gates were used. Two more gates were provided near the tops of the two "arms" and the piece is now being run at 600 p.s.i. and 400° F.

Molding is done on a 2-oz. machine; the molder states that greater capacity is not needed for the job because it could not be used to full advantage unless a multi-cavity mold was employed. And with two or more cavities the operator would have difficulty removing the locking hooks from the mold-insert undercuts without distorting the pieces. Because of the small platen area of the 2-oz. machine, the mold was shaped to fit between the tie-base and to extend beyond and below the platens.

A complete shot of the band, as removed from the machine and before manual degating, is 24 g.; the degated band weighs 13 grams. The scrap is reground right at the machine and is mixed with virgin material in about a 20:80 ratio for re-use. Before the molding compound is introduced into the machine hopper, it is dried and preheated in an oven for 45 min. at 170° F.

Assembly

The bands are placed in position as the bottles pass along on a conveyor belt. At one assembly station the lower part is curved and locked, then dropped into place on a passing bottle. At another station, the "arms" are pulled together around the neck of the bottle and the two hooks clipped into place.

CREDITS: Label is molded by Wylie & Green, Philadelphia, Pa., on a 2-oz. Van Dorn machine, for Charles Jacquinet Cie., Inc., Philadelphia. Wylie & Green also made the mold. Material used is Tenite butyrate supplied by Eastman Chemical Products, Inc.

New Thermoplastic

(From pp. 104-108)

is aligned precisely the same from one club to another, whereas with a wooden club, grain irregularities in the wood can produce variations in the shaft angle as this hole is drilled.

For this purpose, Cylolac combines the required impact resistance and a specific gravity very close to that of wood, which greatly simplifies the design problem. The fact that the main body of the club head and the decorative face-plate are made of the same material, fused into a permanent structure during the two-shot molding process, means that they have the same coefficient of expansion and no tendency to develop an overhang or separation at the point where the two parts join.

Vacuum Cleaner Wheels

The impact resistance of Cylolac at elevated or low temperatures which might be encountered in warehouse storage or in the user's home was an important factor in General Electric's specification of molded Cylolac wheels for a new tank type vacuum cleaner now appearing on the market. The wheels, mounted on the ends of a cylindrical tank, permit the cleaner to roll smoothly to any desired location and thus eliminate the need for a long hose. The vacuum hose and attachments plug directly into openings in the side of the cylinder, which rolls like a spool on its rubber-tired plastic wheels and cannot overturn.

In working out the design of the wheel, a number of different plastics materials were tested in a temporary mold. Cylolac proved best for the specifications. It withstood high exhaust air temperatures of the cleaner without distorting under load, it could withstand shock at low temperatures without distortion or fracture, and it proved to be a good bearing material. Also, it molded readily and gave the finish desired.

The wheels are molded by General Electric's Plastics Dept. in Decatur, Ill., using two molds. One is a two-cavity die running on a 48-oz. Watson-Stillman machine; the other is a three-cavity mold on a 60-oz. H-P-M. The material is preheated to a minimum of 160° F. to eliminate moisture and to ease flow. The wheels are gated in the center by

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means of four runners and gates; the gates are large as compared to those used by G-E for other materials— $\frac{1}{32}$ by $\frac{1}{8}$ in., with $\frac{3}{16}$ -in. runners. The molds were designed and built as hot-runner molds to obtain good flow and finish. Each cavity has approximately 300 sq. in. of cooling area and cavity temperature is 195° F. G-E reports that the molding cycle is a little longer than that required for high-impact styrene, but not excessive when cross-section and weight of wheel are considered.

Coil Forms

Based on an extensive study of Cicolac's characteristics and of the molding techniques required to obtain optimum properties, G-E's Plastics Dept. at Taunton, Mass., found that this material could be used in place of nylon for certain applications. For example, a coil form for a TV picture tube has been converted to Cicolac. Equivalent performance is obtained at a 50% cost reduction. The coil form has exceptionally high strength even though very thin wall sections are specified. Other important properties required in this application are high insulation value, stability, and heat resistance.

Tape Reels

American Molded Products Co., Chicago, Ill., is using Cicolac for a 7-in. diameter magnetic tape reel, 3 in. wide, which is used in 24-hr. monitoring of radio communications. Made in two halves which are later cemented together to form the finished unit, the complete reel weighs approximately 5 oz. and is produced in a two-cavity mold on 8- or 12-oz. machines. According to the molder, Cicolac was selected for this application primarily because its toughness helps to insure against breakage. Dimensional stability also is a safeguard against warpage which might interfere with the action of the tape.

The magnetic recorder on which these reels are used, made by Standard Business Machines Mfg. Co., is of the dual channel variety, employing a 3-in. wide paper tape 1000 ft. long.

Pipe Fittings, Lawn Sprinkler

Sloane Mfg. Co., Pacoima, Calif., makes use of Cicolac, along with other plastics, in its extensive line

of molded pipe fittings. The company reports that Cicolac has much to offer for products of this type, which must be sufficiently rugged to withstand considerable abuse. Ease of molding, it is further reported, provides parts with a minimum of flow and weld lines, thus producing strain-free fittings and smoothness of appearance.

Closely related to molded pipe fittings is the "Snorkel" pop-up sprinkler head produced by Skyline Industries, Titusville, Pa., for use with its packaged "do-it-yourself" lawn spray system. This system includes nine molded sprinkler heads and a 90-ft. coil of 3/4-in. extruded polyethylene pipe. The spray heads rest flush with the surface of the lawn when the water is turned off and permit passage of the lawn mower without damage; but a center insert pops up approximately 2 in. when water pressure is applied.

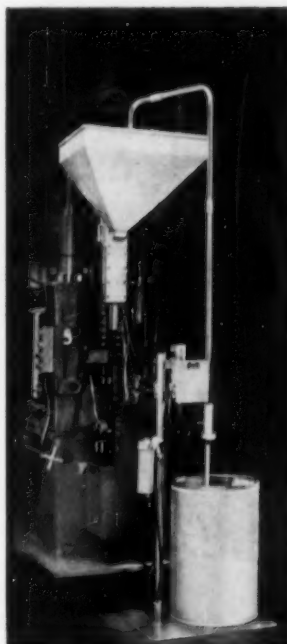
The four basic parts of the spray head are molded of Cicolac, with the body of the unit in green and the pop-up insert in red. According to a company spokesman, Cicolac was selected for this application because the material is not damaged by water freezing inside the head nor by exposure to sunlight or burial in the soil. The completely assembled unit weighs approximately 6 oz. and measures 6 in. in height with the pop-up insert retracted.

The four molded components which make up the finished sprinkler head involve such details as deep coring, strengthening fillets, tapered ridges to provide a tight fit for the polyethylene pipe, internal and external molded threads for assembly of the unit, and a series of small channels through which water is fed to the end of the pop-up insert, where it impinges against a mushroom-shaped top to produce the desired spray pattern. Skyline produces these parts on 16-oz. H-P-M injection equipment, using 8-cavity automatic molds.

Opportunities for Extrusions

One of the most promising applications for extruded Cicolac, according to Marbon, is in plastic pipe. Carlon Corp., Cleveland, Ohio, is among the companies now working with the material on pipe and fittings. It is believed that Cicolac pipe will be particularly useful in applications where high burst pres-

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tures are required. Its resistance to various chemicals indicates a good outlet for extruded pipe in both the oil and the chemical industries. Cycolac pipe can be joined together by simple methods and, because of its good elongation, a swaging process, similar to that used with copper tubing, may turn out to be a quick and economical procedure.

Many other opportunities exist for extruded applications. Jarrow Products, Chicago, Ill., is extruding several type of Cycolac sections which are used in sliding screens or windows in the construction field. In each of these applications, low coefficient of friction, along with toughness, is important. The extruded sections provide their own bearing surface and require no lubrication.

In Sheet Form

O'Sullivan Rubber Corp., Winchester, Va.; Bolta Products Div., General Tire & Rubber Co., Lawrence, Mass.; and Auburn Button Works, Inc., Auburn, N. Y., are among the organizations which have worked on the production of rigid

Cycolac sheets. In this form, the material offers interesting possibilities for vacuum forming, plug and ring forming, and low-pressure molding in general. Typical applications for such sheets would include such items as machine housings, point-of-purchase displays, tote boxes for heavy duty assignments, and aircraft interior trim. According to Bolta, tests indicate that the Cycolac sheets have excellent low-temperature properties and that the material calenders well. O'Sullivan is currently calendering and embossing the material and offering it through its own sales departments under the tradename of Sullvac, in gages up to 0.030 in. and widths up to 72 inches. One O'Sullivan customer is converting these sheets into an easily applied "do-it-yourself" wall panel.

Other typical Cycolac parts now in production, which indicate the application versatility of the material, include a handle grip for carpet sweepers, molded by Wolverine Plastics, Milan, Mich.; small bushings for a trouser hanger, produced by Shaw Insulator Co., Irvington, N. J.; a hammer handle trim

disk adopted by Rampe Mfg. Co., Cleveland, Ohio; and a slotted cable harness holder being used by a major supplier of electrical equipment to the automotive industry. To these products might be added television tube holders, golf club ferrules, and bowling pins in which the material is injection molded over an inner core to form a tough, protective exterior sheath.

Among the many other evaluated end uses for Cycolac are such items as fountain pen barrels, knife sharpener holders, lawn mower wheels, automotive armrests, adding machine covers, golf bag bottoms, movie projector housings, battery case covers, luggage components, refrigerator striker plates and other parts, saw handles, safety helmets, piano action blocks, geared sleeves and gear blanks, extruded edge moldings for furniture, and others.

This new thermoplastic is also expected to find many applications in equipment for the food processing industries because of its excellent resistance to oils, fats, greases, acids, and alkalies, as well as its negligible toxicity.—END

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EQUIPMENT • SUPPLIES • SERVICES

FLAME RESISTENT POLYESTER RESIN. Booklet describes "Hetron" polyester resins, giving special emphasis to test data on their flame-resistance. Tables also give physical properties of specimens of Hetron castings, Hetron resins, and 1/16 in. sheet. Hooker Electrochemical Company. (I-501)

POLYETHYLENE MATERIALS. File folder details the properties and chemical resistance data on a wide range of polyethylene formulations available as film, sheet, rod, pleat, block, billet, pipe and molded forms. Catalog data on stock dimensions, gauges, weights is included. Also described is a line of fittings for plastics pipe. Allied Resinous Products, Inc. (I-502)

HALF OUNCE INJECTION PRESS. Literature describes operation and presents detailed specifications of "Model 73" half-ounce horizontal fully automatic injection molding press capable of 1400 cycles/hour. Prices of press and available accessory equipment are included. Moslo Machinery Co. (I-503)

MOLDS FOR VACUUM FORMING. Brochure describes the uses and special features of 3 types of vacuum forming molds made by this manufacturer: plaster, resin, and sprayed metal. Rules of thumb for price estimating are included. Metal Mold Forming Co. (I-504)

MOLD STEEL. Illustrated booklet gives analysis, suggested applications, and detailed specifications of "Speed Alloy" steel plate. Instructions on heat treating and welding are included. W. J. Holliday & Co. (I-505)

COLOR PASTES FOR VINYL PLASTISOL. Technical bulletin gives detailed information on physical and chemical properties of company's "K" series of stir-in, calibrated color pastes for vinyl plastisol compounding. Prices are included. Claremont Pigment Dispersion Corp. (I-506)

TUBE, ROD, AND SHEET STOCKS. Catalog tabulates in detail the properties, available colors and sizes of the "Cadco" line of cast acrylic tube, rod, and sheet stocks. Detailed specifications are also given on an extensive line of polyethylene, methacrylate, polystyrene, Tygon, Teflon, nylon, vinyl, and acetate sheet, rod, and tube materials. Cadillac Plastic Co. (I-507)

SAWING AND GROOVING OF PLASTIC SHEET. Bulletin describes and gives performance data on a machine used for sawing, grooving, and multiple cutting of large sheets of plastic. Variety of accessories suit the machine for many fabricating operations on plastics sheet and laminates. Merceen-Johnson Machine Co. (I-508)

MOLD TEMPERATURE CONTROL UNIT. Sheet describes features and gives specifications of "Die-Temp" temperature control unit, which operates on plus/minus 1/10° in the temperature range 60° to 220°F. Unit has a pump capacity of 20 gal./minute. Thoreson-McCosh, Inc. (I-509)

RESIN FOR TOOLING. Illustrated brochure provides information on "Ren-ite," a thermosetting resin for use as a laminating plastic without application of heat or pressure for general tooling applications. Properties and typical uses are given. Ren-ite Plastics, Inc. (I-510)

INJECTION PRESSES. Data sheets give photos, description, and specifications of line of 1-, 2-, 2-oz. semi-automatic, and 2½-oz. injection presses. The Van Dorn Iron Works Co. (I-511)

ELECTRONIC PREHEATER. Data sheet presents specifications and special features of electronic preheater with 3½kw maximum power output. W. T. LaRose & Associates, Inc. (I-512)

ANTI-STATIC COATINGS. Technical bulletin reviews problem of static electricity in plastics and gives description and methods of application of two anti-static coatings, one for polystyrene and the other for acrylic, acetate, butyrate, and vinyl. Bee Chemical Co. (I-513)

POLYVINYL ALCOHOL FILM. Booklet offers detailed description of the physical and chemical properties and characteristics, appearance, standard sizes, and end uses of company's polyvinyl alcohol film. Mono-Sol Corp. (I-514)

CORE MATERIALS. Thirty-two page booklet gives detailed description and performance tables for honeycomb core materials. Types of materials covered include aluminum, steel, glass fabric-plastic, and cotton fabric core constructions. Hexcel Products Co. (I-515)

POLYESTER RESINS. File folder contains technical data sheets on seven polyester resins adaptable to glass reinforced molding. Information covers applications, properties, and curing data. H. H. Robertson Co. (I-516)

ELECTRONIC HEAT SEALING EQUIPMENT. Literature describes line of electronic heat sealers with 1-, 2-, 4-, and 6-kw output capacities. Also described are 25 kw and 10 kw generators, an are suppressor, and an automatic turntable. Sealomatic Electronics Corp. (I-517)

ALCOHOLS AND PLASTICIZERS. Thirty-two page booklet describes three alcohols (isooctyl, decyl, and tridecyl) and their use in the production of plasticizers. The performance of the resultant plasticizers in vinyl formulations is discussed in detail. Enjay Co., Inc. (I-518)

AUTOMATIC COMPRESSION PRESSES. Literature presents description of three automatic presses with pressures ranging from 20 to 300 tons. Construction details, special features, specification data, and schematic drawings are included. B.I.P. Engineering Ltd. (I-519)

SHEET CHOPPER. Booklet describes the "Lugano 80" sheet chopper, slitter, and creaser that will chop roll plastic stock or sheet plastic stock transversely into strips from zero to 7½ in. wide. Unit will also slit and slant or crease material longitudinally. Specifications, diagrams, and operation details are included. S. & S. Corrugated Paper Machinery Company. (I-520)

FILM CONVERTING EQUIPMENT. Illustrated data sheets give facts, prices, specifications on diverse line of film handling equipment, including an embosser, tensionless tubers, winder, and slitter. Also, such accessories as idlers, rolls, friction clutches, spray heads. T & M Machine & Tool Co. (I-521)

POLYSTYRENE MOLDING MATERIALS. Illustrated brochure depicts recommended applications and provides tabular data on the mechanical, thermal, optical, chemical, electrical, and molding properties of "Kleestron" polystyrene. Kleestron Ltd. (I-522)

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SMALL COATING MACHINE. Illustrated data sheet presents design features, operational details, and specifications of company's "Type 2R" machine for hot or cold coating of flexible or rigid sheet materials with resins, thermoplastics, lacquers. Available in models that will handle widths from 5K to 14K inches. Potdevin Machine Company. (I-523)

VACUUM PUMPS. Illustrated catalog complete with engineering drawings, performance curves, dimensions, and specifications presents detailed information on extensive line of vacuum pumps with capacities up to 40 cu. ft./minute. Leiman Bros., Inc. (I-524)

LAMINATED PLASTIC RODS AND TUBES. Illustrated catalog presents detailed specifications, properties, weights, grades, descriptions and standards of "Synthane" tube, rod, and sheet stocks. Various applications are discussed. Synthane Corp. (I-525)

PORTABLE INDUSTRIAL OVENS. Literature contains photos, descriptions, and detailed specifications of a line of heavy duty cabinet ovens for production and laboratory work where uniform temperature is important. Prices are given. Grieve-Hendry Co. Inc. (I-526)

INJECTION PRESSES. Illustrated brochure contains detailed specifications of the "New Lombard" 12 and 16 ounce injection molding machine. Machine features centralized hydraulic control panel for simplified inspection and maintenance. Injection Molding Machine Division, Lombard Governor Corp. (I-527)

THE NYLON COATING OF WIRE. Reprint with this title discusses basic methods and equipment required in the application of nylon coatings to electric wire. The booklet covers, in detail, the various steps in each process and lists additional available literature. Industrial Ovens, Inc. (I-528)

SMALL HYDRAULIC PRESSES. Catalog gives detailed facts and photos on company's line of small air-powered "Hydrolair" hydraulic compression presses. 30, 50, 75, and 100 ton models are available. Detailed specifications and optional modifications are also given. Elmes Engineering Division, American Steel Foundries. (I-529)

PRE-IMPREGNATED GLASS MAT. Folder gives features and uses of "Sunform," a glass cloth and mat impregnated with polyester resin plus catalyst, used for low pressure laminating. Maker claims material can be stored for six months at normal room temperatures without deterioration. Electro-Technical Products Division, Sun Chemical Corp. (I-530)

ELECTRONIC HEAT SEALER. Literature describes and gives specifications of 3-Kilowatt "Cosmos-Automatic" electronic heat sealer and accessory dies. Press has work-bed area of 19 by 25 in., daylight of 8K inches. Samples of machine's work also supplied. Cosmos Electronic Machine Corp. (I-531)

PLASTICS PIPE & TUBING. 20-page catalog describes uses, characteristics, physical and chemical properties, dimensions, and physical data on company's extensive line of stock pipe and tubing made from Saran, butyrate, and polyethylene. Accessory fittings such as elbows, reducers, adaptors, and flange unions are also presented. Mills Plastic Pipe Division, Continental Can Company. (I-532)

ELECTRIC POWER DRIVES. Twelve-page illustrated booklet describes the design and engineering features of each of company's four basic electric motor types: variable speed, constant low speed, totally enclosed, and splash or drip-proof. Remote and automatic speed controls are also described. Sterling Electric Motors. (I-533)

POLYETHYLENE SHEETING. Bulletin provides information on current and suggested uses of heavy gauge polyethylene (from 0.15 to .125 in.), and offers tabular data on its properties and its resistance to more than thirty chemicals. Celanese Corporation of America. (I-534)

PANEL SAWS. Sheet shows photo and gives description of fully automatic panel saws with electro-mechanical drive. Available in semi-automatic model; also, drive motors available for carriage travel speeds of 20, 30, or 60 ft./minute. Hendrick Manufacturing Corporation. (I-535)

2 STAGE GRANULATOR. Literature shows schematic photograph, lists specifications and prices of "N-400" two stage, high output granulator with 11 by 17 in. throat. Machine features two cutting chambers, quick clean-up, drum height discharge. Injection Molders Supply Co. (I-536)

THERMOPLASTIC SHEET. Literature gives prices, gauges, colors, and characteristics of company's line of stock cellulose acetate butyrate and styrene sheet. General Plastics Corp. (I-537)

PREFORM OVEN. Literature discusses and illustrates with scale drawings a line of single and double compartment preform ovens used in the production of fiber reinforced plastic. The Lanly Co. (I-538)

LITHOPHONE PIGMENTS. Brochure and chart show line of eleven Cadmium Lithophone pigments available for use in manufacturing plastics colorants. Each color is broken down into three shades, and properties chart gives specifications. The Harshaw Chemical Co. (I-539)

TOTE BOXES AND TRAYS. Folder discusses use of fabricated fiberglass reinforced plastic containers as an answer to materials handling problems. Points out how food processors, textile and rubber mills, and metal manufacturers can have light weight, longer lasting boxes made to specifications. Fiberglass Box Co. Inc. (I-540)

ALKYD RESINS. Reprint from Modern Plastics Encyclopedia discusses use of alkyd resins in compression and transfer molding. Among subjects covered are press and equipment requirements, special mold design considerations, preheating, preforming, molding techniques, molding temperatures, inserts, and storage. Barrett Div., Allied Chemical & Dye Corp. (I-541)

VINYL WIRE COATING. 18-page booklet details the properties of "Geon" vinyls, used in insulating wire and cable. Detailed recommendations are given of types suitable for tubing, jacketing and primary insulation. Compounding, mixing methods, and extrusion methods are covered. B. F. Goodrich Chemical Co. Div. of B. F. Goodrich Co. (I-542)

BALSA FOR CORES. Folder contains sheets giving grades and specifications, mechanical properties, gluing instructions, and other information on balsa, used as a core material in reinforced plastics products of many types. Balsa Ecuador Lumber Corp. (I-543)

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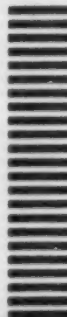
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Flexible Foams

(From pp. 114-117)

purchased by the pound, the density of the foam is obviously important.

Foamed latex articles have varying densities depending upon the use, ranging from approximately 3 to 10 lb./cu. foot. Vinyl foam slab being relatively new, is being sold, so far, in only two densities—6 and 8 lb./cu. foot. However, lower densities have been reached experimentally. Urethane foam is being offered in densities of 2 to 5 lb./cu. foot.

Density Related to Use

There is, however, a relationship between the density of the foam and the use to which it is put. This relationship is described as the load-carrying capacity. For comfort in cushioning, as in furniture and bedding, it is desirable to have a steady firming up of the cushion as it is deflected. This is obtained with foamed latex. As density is reduced, the softer the material becomes; that is, the more deflection is obtained with a given load.

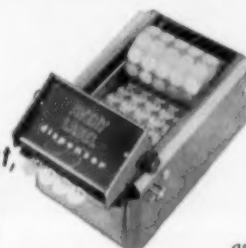
Vinyl foam acts in a manner very similar to foamed latex in that it also exhibits a steadily increasing firmness as the foam is deflected. However, with vinyl foam there is a different relationship between firmness of the product and density. In foamed latex, the firmness is approximately proportional to the density, whereas in vinyl foam firmness is almost independent of density, but is obtained by formulation. The commercially available urethane foam tends to behave in a different manner, particularly for the lower density material. In this instance, as the foam is deflected, there is an initial resistance to deflection, which soon vanishes and a major deflection is made with very little extra force. This implies that, if one were to sit upon such a foam, it would at first appear "boardy," and then would suddenly give away, compressing to a very thin cushion. Heavier-density urethane foam, for example, 5 or more lb./cu. ft., still exhibits some of this, but is closer in its behavior to foamed latex than is the light-density material. This problem of the peculiar load deflection properties of urethane foam is also being studied.

Foamed latex is a resilient mate-

(To page 234)

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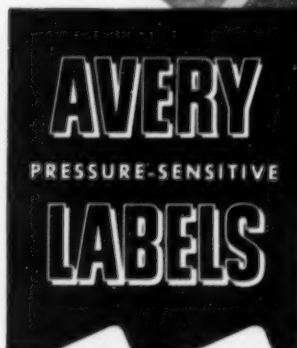
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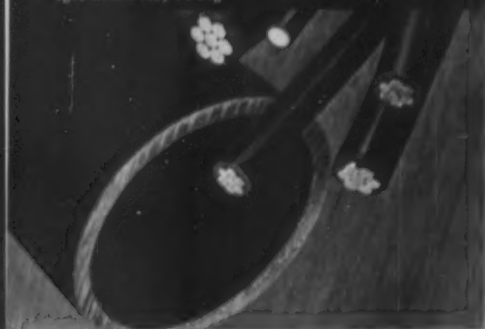
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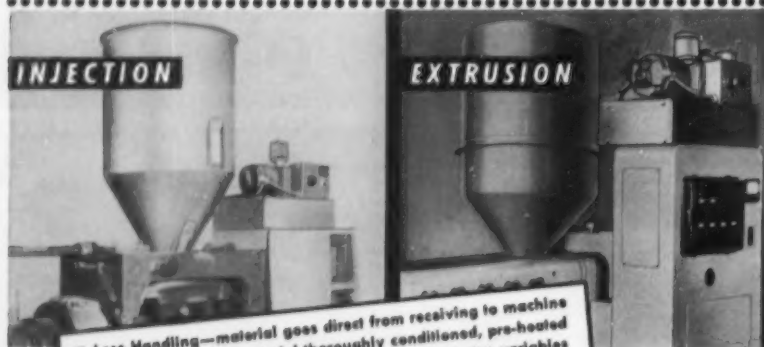
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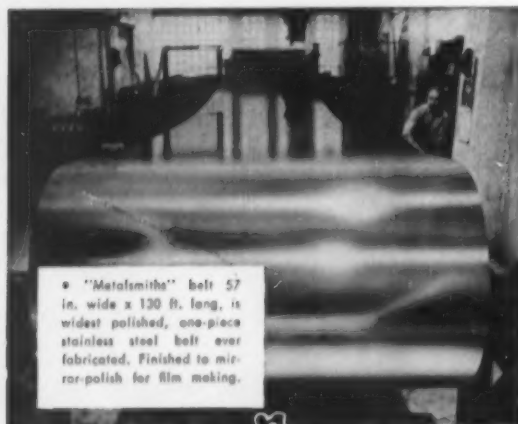
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rial, but since it absorbs more energy than does a spring case, it can give a more comfortable ride when made into a deep seat for a vehicle. The resilience of both vinyl foam and polyurethane foam varies with the formulation. Some formulations of vinyl foam appear to be rather "dead" and very slow on recovery after deflection. Other samples are quite snappy and recover quite quickly after being deformed. In general, urethane foam lies somewhere between vinyl foam and foamed latex in resilience.

Solvent Resistance

Foamed latex has the disadvantage of having low resistance to solvents and oils; both vinyl and polyurethane foams are better in this respect. Vinyl foam is resistant to oils and solvents except for ketones, chlorinated hydrocarbons, low-molecular-weight esters, and aromatic hydrocarbons. It is easily cleaned without damage by most soaps and detergents (3). Urethane foam will swell in chlorinated solvents, benzene, ketone, and certain esters. It is resistant to oils, gasoline, alcohol, ether, and turpentine (4). The newer variations of urethane foam are more resistant to boiling water.

Urethane foam is not as good as foamed latex for low-temperature flexibility, but it does not become brittle at any temperature down to -60° F. Vinyl foam readily stiffens at low temperatures, unless specifically compounded for such service. Foamed latex, although difficult to set on fire, readily supports combustion. Both vinyl and urethane foams can be readily compounded so as not to support combustion. Because of the plasticizers used in vinyl foam, attention has to be given to the problems of odor and migration.

Consumption and Uses

As previously noted, U. S. foamed latex consumption increased from 18 million lb. in 1947 to over 160 million lb. in 1953. The major part of this was used for seating and cushioning, i.e., bedding, mattresses, pillows, furniture cushioning, automobile seats, upholstery backing, etc. Linear extrapolation of the consumption figures indicates a U. S. consumption for flexible foam materials of 300 to 400 million lb. per year by 1960. The market potential of vinyl foam versus foamed latex de-

depends on the extent to which the problems with the two materials are overcome and obviously on the relative prices. They also depend upon the acceptance of polyurethane foams. It has been estimated that the vinyl foam potential in 1960 could be anywhere between 75 and 200 million lb. (3). Possibly, one-half to two-thirds of this vinyl foam potential would *not* be in competition with foamed latex.

The market potential of polyurethane foam will depend on how rapidly its sensitive production problems are overcome, on whether its peculiar deflection properties and its somewhat dead resilience properties will hinder its acceptance, and, of course, upon the relative price of the three foams. Also to be considered is whether a good flame-resistant foam rubber can be developed. Poundage-wise, the market potential for polyurethane foam may be somewhat less than the vinyl foam potential, because of the lower densities of polyurethane foam that may be used. The U. S. potential in 1960 may be 100 million lb. (3). Again, about half of the production of polyurethane foam would *not* be in competition with foamed latex.

Vinyl foam has possibilities in arm rests; crash pads; gasketing; wearing apparel; rug underlay; shoe innersoles; upholstery backing materials, particularly for heat-sealing applications; cushioning; sponges; packaging; and acoustical and heat insulation uses (3).

Polyurethane foams can have application in automotive seat cushion toppings; rug underlays; upholstery backing; composite articles, because of its ability to be foamed in place and to adhere; sponges; packaging; wearing apparel; cushioning; and acoustical and thermal insulation purposes. Polyurethane foam may not displace vinyl foam where toughness is desired (3).

Foamed latex has been used for shoulder pads, but they must be removed before dry cleaning. Both vinyl foam and polyurethane foam are better in this regard. It might be possible to use vinyl foam more successfully than foamed latex for slippers.

Foamed latex is used occasionally for rug underlay, but it is expensive in relation to sponge rubber. Vinyl foam and polyurethane foam of low density but high load-carrying ca-

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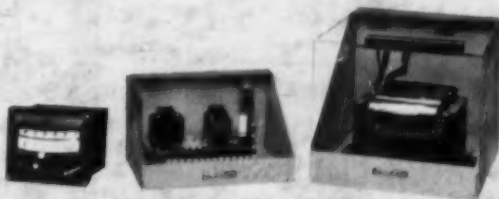
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capacity may be more successful for this field. Vinyl foam and polyurethane foam will be tried for articles like pillows, mattresses, and cushioning, although they have certain disadvantages which must be solved.

It has been estimated that foamed latex has captured only 15 to 20% of this market because of the relatively high cost and fabricating expense. Vinyl foam has the disadvantage of poor compression set, plasticizer migration, and odor, but may be considered for such household articles because of potentially lower cost, non-flammability, ease of fabrication, and less "fight-back." Polyurethane also has potentially low cost volume-wise, and non-flammability, and hence should also be considered for these purposes. The problem of its peculiar deflection curve must be considered, however, so that the products would be comfortable.

Vinyl foam is a possibility for shoe innersoles, because of light weight, shock absorption, and high tear resistance. For this purpose, foamed latex has exhibited poor aging. Because of low tear, the experience with polyurethane shoe innersoles in

Germany has been poor. Foamed latex is currently being used for automotive seat cushion toppings. Vinyl foam could be used for this and attached directly to the upholstery material, but there is some doubt about its compression set, particularly if the car became warm when parked in the hot sun. Polyurethane foam may be used for this purpose because of its flame resistance, lighter weight, and cost. However, the question of comfort must be watched (3).

Costs of the Foams

In general, the capital investment for equipment to make vinyl foam and polyurethane foam is lower than that required to make foamed latex. The capital investment cost per unit volume of foamed latex produced is about twice that of the similar cost of vinyl or polyurethane foam.

As far as processing costs are concerned, it must be remembered that certain operations necessary with foamed latex are unnecessary in producing vinyl foam and polyurethane foam. Raw material prices for both vinyl foam and for polyurethane

foam are decreasing. Already, vinyl foam and polyurethane foam slab have been offered at prices competitive with the price of foamed latex. It may be that the present selling prices are not realistically related to current costs, but at least they do reflect the confidence of these manufacturers in the future of these new materials. Because of the difference in properties between the three materials, there will be room for all three, but there will be intense competition over certain areas of use.

References

1) "Vinyl Sponge and Foam Processing and Applications," George R. Sprague, director of research, The Sponge Rubber Products Div., B. F. Goodrich Co.

2) U. S. Patent No. 2,666,036.

3) Information supplied by Elastomer Chemical Corp.

4) American Collo Corp.

Also see the articles "Foamed Plastics," p. 117, "Foaming Agents," p. 322, and "Foaming Plastics," p. 609, as well as the "Foamed Plastics Chart," p. 843, MODERN PLASTICS Encyclopedia Issue, 1955.—END



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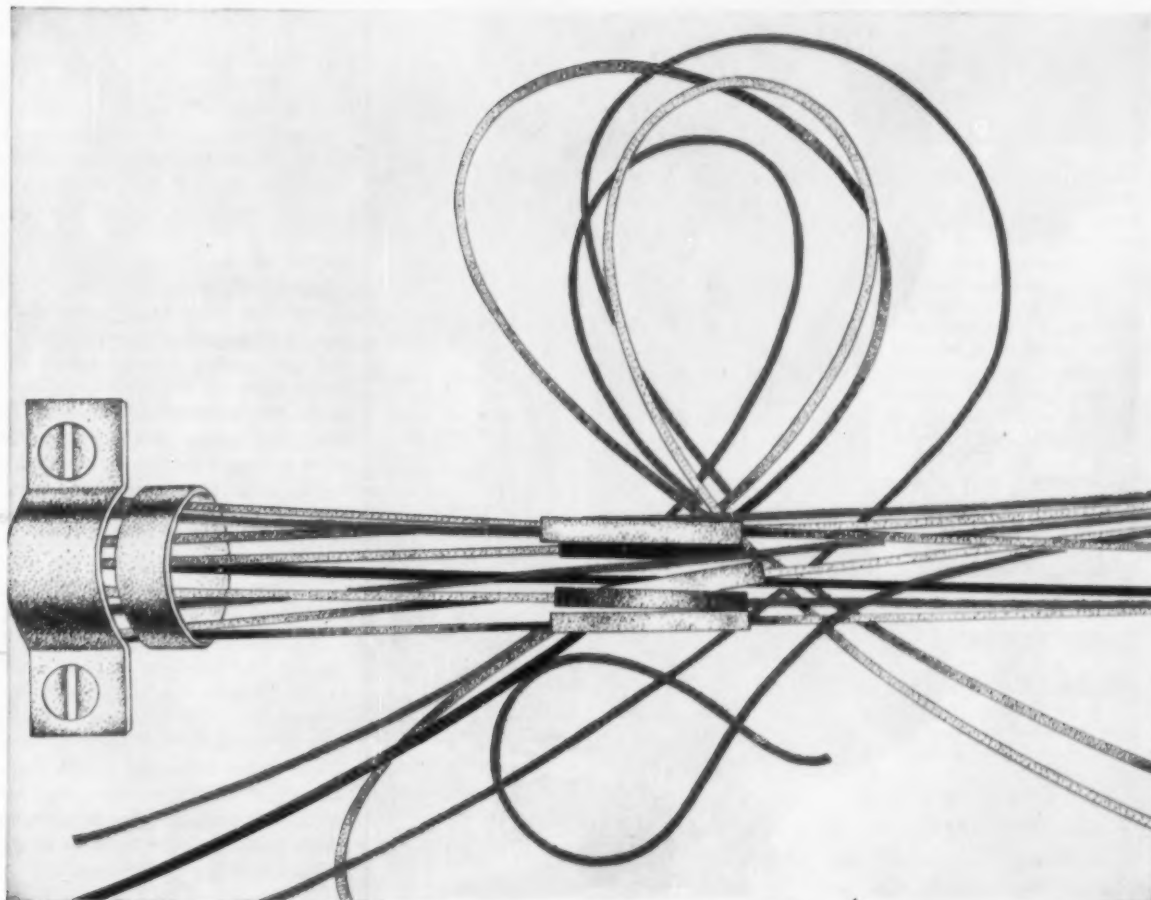
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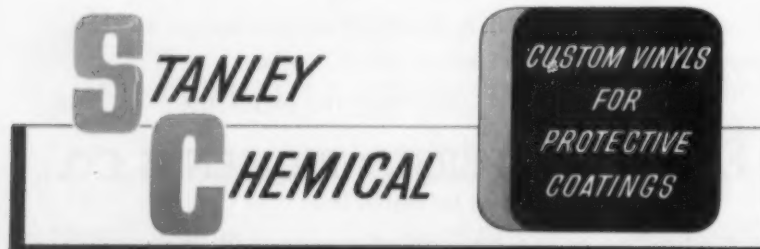
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Bite on Styrene

(From pages 118-119)

approximately 18 in. high, the unit is of vertical design and takes up little space in the dental laboratory.

In molding a Jectron denture, the dental laboratory technician begins with the usual "cast" or positive gypsum reproduction of the patient's jaw. The denture pattern is formed on the cast in wax. Porcelain or plastic teeth, as required, are anchored in the wax. The wax pattern is completed by adding intake and exit sprues, through which the plastic material will ultimately flow, at the two extremes of the cast. The smaller diameter of the exit sprue helps to retard the flow of the molding material, facilitating the complete filling of the mold. Next, the denture is placed in a metal flask and gypsum type investment material is poured around the denture and allowed to harden.

The flask then undergoes a "boiling out" process during which the wax is driven out of the investment, leaving the exact impression of the desired denture. The flask is next placed under infra-red lamps. During this drying operation, any residual moisture in the investment which might produce bubbles in the finished molding is removed.

For the actual molding operation, a bar of Jectron styrene is placed in a cylinder known as the "injection tube" and the tube is placed in an electric oven at a temperature of approximately 410° F., until the resin has become thoroughly softened; this heating operation requires about 30 minutes.

When both the flask (which surrounds the mold) and the plastic are ready for injection, the flask is locked into place in the machine with a series of pins. Next, the injection tube, with its charge of soft resin, is removed from the oven and threaded into place on top of the flask.

The head of the machine, which contains the electric driving mechanism and the ram assembly which forces the softened plastic into the mold, is hinge-mounted, permitting it to be tilted back when inserting or removing injection tubes.

Once the ram has been brought into line directly above the injection tube, the "Down" button is pressed;

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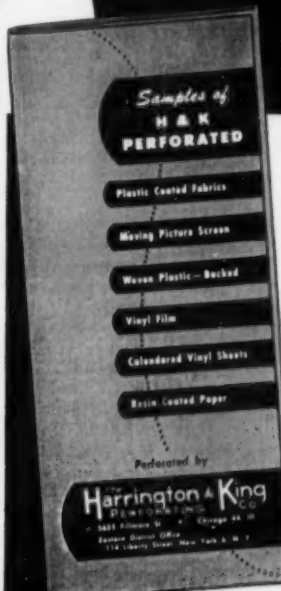
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the ram comes down, forcing the softened plastic from the injection tube into the mold cavity. As soon as some of the molding material begins to emerge through the exit gate, indicating that the mold has been filled, the power is shut off. A gate in the side of the flask helps the surplus material to escape.

The flask is then left locked in the machine for a cooling period of approximately 20 minutes. Pressing the "Up" button returns the ram to its top position, so that the tube can be removed from the flask.

The molding machine is provided with ejector arms and an ejector plate that facilitate ejection of the investment from the flask.

Within 2 hr. after molding, the denture can be taken out. The technician uses a saw to cut into the investment surrounding the cast. The investment material is broken away and the completed moldings are removed, ready for final finishing operations.

Translucent Pink

Jectron bars are supplied to laboratories in a shade of pink that most nearly duplicates natural tissue tones. The material is translucent and thereby varies in shade, depending upon the lightness or darkness of the underlying natural tissues. Dental laboratories which produce Jectron dentures are also supplied with a kit consisting of six different shades of material in powder form, including white, tissue pink, light opaque purple, red, purple, and fibrous red. To produce variations in color on the portions of the denture that will be exposed when a patient laughs or smiles, the technician applies the coloring agent directly to the mold surface prior to injection so that it fuses permanently into the finished denture.

The Jectron Co. states that the special styrene bars are extruded under pressures up to 30,000 p.s.i. in order to obtain high density. It is claimed that this method provides maximum density and strength for the molded denture, at the molding pressures allowable with the gypsum mold, which may be damaged at loads exceeding 8000 p.s.i.

CREDITS: Basic styrene material is supplied by The Dow Chemical Co., and processed into finished bars by Jectron Co. Special molding press, melting oven, and related equipment supplied by Jectron Co.



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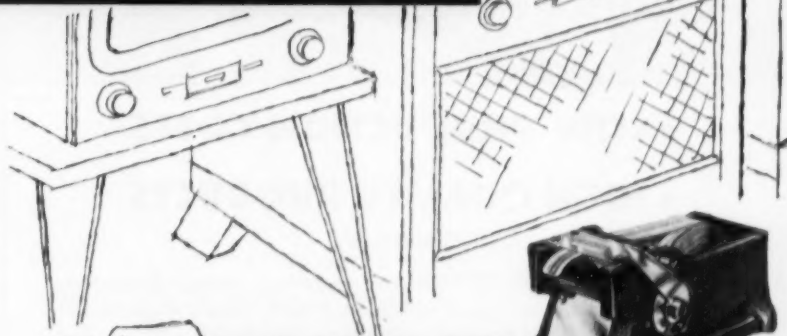
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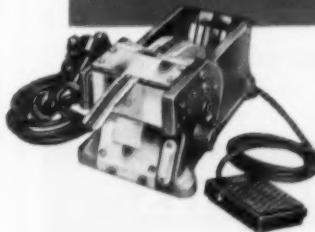
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Progress in Plastics

Methods of Study

(From pp. 151-156)

flow. Thermocouples were used to measure the temperature of the two surfaces and of the center plane of various thicknesses of panels. The data showed the expected temperature distribution in the panel. They also showed the overwhelming effect of the high rate of heat transfer on the outer surface in dictating the center plane temperature (Fig. 22). The importance of air velocity over the inner surface in determining center plane temperatures also was demonstrated (Fig. 23, p. 244).

Assuming that the measured tem-

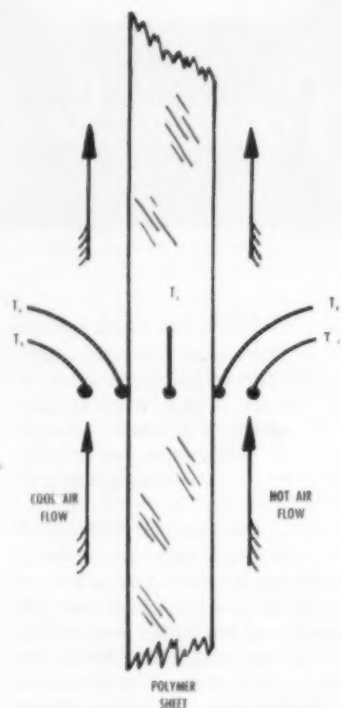


Fig. 21—Schematic representation of process of thermal gradient testing

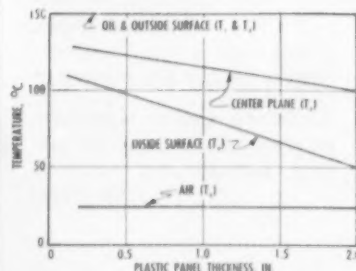
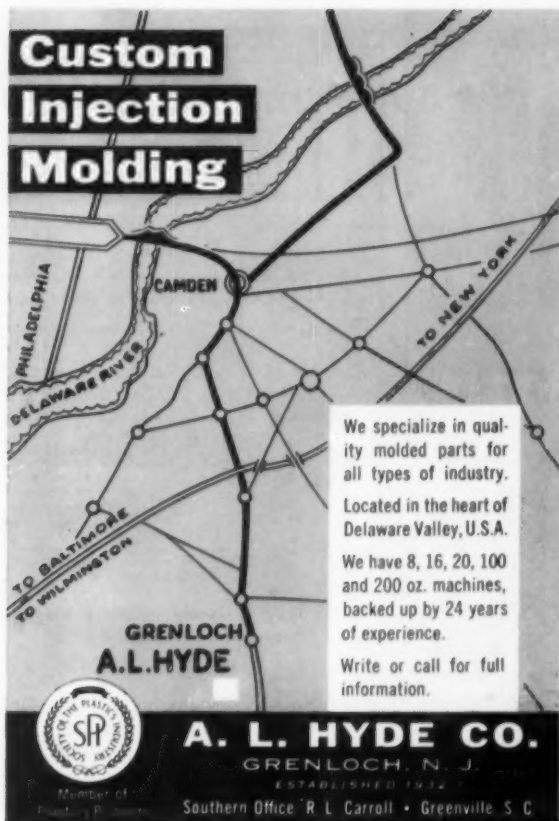


Fig. 22—Thermal gradient in plastic sheet (for air flow of 50 ft./minute)

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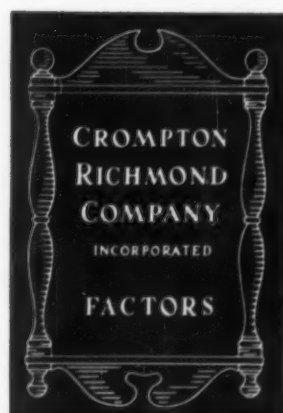


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All because Crompton cashes receivables with top speed — and without recourse. The saving in receivable bookkeeping, credit risk, and collection chores just about pays for the factoring.

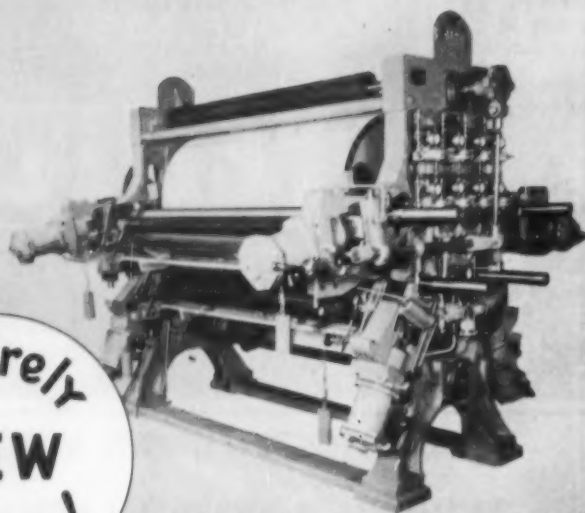
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This high-speed gravure printer handles plastic films and textiles in widths up to 72".

Proven center-drum design assures tight register on lightweight webs. New air cylinder pressure control allows better quality printing with easier adjustment. For example—each print nip can be controlled individually. All four print nips or any combination can be moved into or out of printing position simultaneously from a common control valve.

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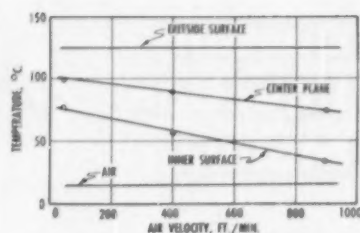


Fig. 23—Effect of air velocity across inner surface of thermal gradient in plastic sheet

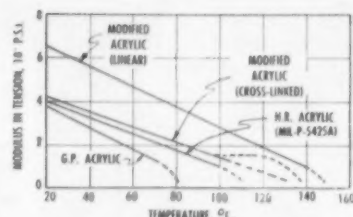


Fig. 24—Tensile modulus of elasticity (measured as tangent modulus)

peratures are valid, we propose the following analytical approach:

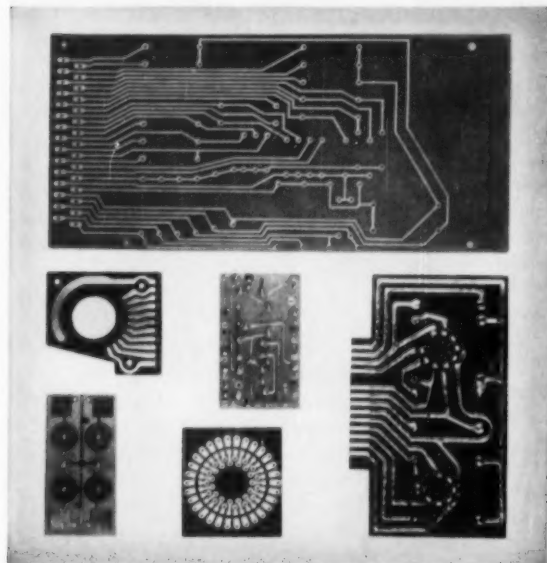
- 1) Determine an outside and inside surface temperature for the part in question under the defined service conditions.
- 2) Select a material on the basis of its desirable properties other than that of H.D.T.
- 3) Determine the S.S.T. of the material on the basis of a 100-day modulus of 100,000 p.s.i.
- 4) Select and use a panel thickness such that its center plane temperature will not exceed the S.S.T. and its outer surface temperature will not exceed the T.S.T. of the materials.

Step 1 may have to be accomplished by simulated experiments. Steps 2 and 3 will be based on data available from manufacturers and evaluation groups such as the A.R.T.C. Step 4 merely assumes linearity of a modulus versus temperature relationship (Fig. 24). The validity of this assumption has been demonstrated through tensile creep tests at different temperatures.¹

We expect this approach to precipitate some discussion. We hope it will evoke better proposals for solving the existing dilemma regarding the requirements of a material for constructing transparent enclosures for high-speed aircraft.—END

¹ "Measurement of Creep of Acrylic Glazing Plastics Exposed to Temperature Gradients," M. Slone and F. W. Reinhart, S.P.E. Journal 10, 29 (Dec. 1954).

For the most dependable printed circuits, you need the high bond strength, workability, heat-resistance of **C-D-F DILECTO® METAL-CLAD LAMINATES**



Printed circuits based on C-D-F materials are being used with great success in military electronic equipment, commercial television and radio sets, telephone switchboards—even sub-miniature radiosonde equipment and hearing aids.

Photos courtesy of Photocircuits, Inc., Glen Cove, N. Y.

HIGH BOND STRENGTH—C-D-F's special adhesive for metal-clad Dilecto bonds the copper foil to the plastic without affecting the laminate's superior electrical properties. Heat-resistance, dissipation factor, dielectric constant, dielectric strength, and insulation resistance of the Dilecto base remain unaffected. The closely-bonded foil can be etched cleanly and dipped in hot solder to 220°C. (428°F.) for ten seconds with a guarantee of no blistering or separating. Metal-Clad Dilecto can be punched or machined either before or after etching.

EXCELLENT WORKABILITY—On all five Dilecto metal-clad grades, you can solder, punch, saw, and assemble components either by hand or automatically. Thanks to the inherently superior workability of the plastics laminate over that of ceramic-type materials, Dilecto can be dropped, jammed into tight chassis, and otherwise treated roughly on the assembly line and in service.

HIGH HEAT-RESISTANCE—Metal-Clad Dilecto Laminates are made of phenolic, epoxy, or Teflon® resin for various conditions of service and assembly, and have either cellulosic paper or woven glass-fabric base. All are ideally suited to printed-circuit applications in which heat-dissipation is a major problem. Continuous exposure to high ambient operating temperatures in enclosed electronic equipment has no significant effects on Dilecto's electrical and physical properties.

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| TYPICAL PROPERTY VALUES | | | | | |
|---|--|--|---|---|---|
| | Copper-Clad PHENOLIC (Grade XXXP-26) | Copper-Clad PHENOLIC (Grade XXXP-24) | Copper-Clad EPOXY (Grade GB-116E) | Copper-Clad EPOXY (Grade GB-181E) | Copper-Clad TEFLON® (Grade GB-116T) |
| BOND STRENGTH—0.0014" foil (Lbs. reqd. to separate 1" width of foil from laminate) | 5 to 8 | 5 to 8 | 8 to 12 | 8 to 12 | 5 to 8 |
| MAXIMUM CONTINUOUS OPERATING TEMP. (Deg. C.) | 120 | 120 | 150 | 150 | 200 |
| DIELECTRIC STRENGTH (Maximum voltage per mil.) | 800 | 800 | 700 | 650 | 700 |
| INSULATION RESISTANCE (Megohms) 96 hrs. at 35°C. & 90% RH | 50,000 | 50,000 | 30,000 | 20,000 | Over 10 ⁶ megohms |
| DIELECTRIC CONSTANT 10 ⁶ Cycles | 4.20 | 4.20 | 4.90 | 4.95 | 2.85 |
| DISSIPATION FACTOR 10 ⁶ Cycles | 0.026 | 0.026 | 0.019 | 0.018 | 0.0006 |
| ARC-RESISTANCE (Seconds) | 10 | 10 | 60 | 80 | 180 |
| TENSILE STRENGTH (psi.) | 16,000 x 13,000 | 14,000 x 11,000 | 46,000 x 42,000 | 48,000 x 44,000 | 23,000 x 21,000 |
| FLEXURAL STRENGTH (psi.) | 21,000 x 18,000 | 19,000 x 16,000 | 60,000 x 55,000 | 75,000 x 65,000 | 13,000 x 11,000 |
| IZOD IMPACT STRENGTH edgewise (ft. lbs. per inch of notch) | 0.40 x 0.35 | 0.40 x 0.35 | 6.5 x 6.0 | 13.5 x 11.5 | 6.0 x 5.0 |
| COMPRESSIVE STRENGTH flatwise (psi.) | 28,000 | 27,000 | 60,000 | 62,000 | 20,000 |
| BASE MATERIAL OF LAMINATE | Cotton rag paper | Cotton rag paper | Fine-weave, medium-weight glass cloth | Medium-weave, medium-weight glass cloth | Fine-weave, medium-weight glass cloth |
| COLOR OF UNCLAD LAMINATE | Natural greenish | Natural Brown | Natural | Natural | Natural |

All these standard grades are available with 0.0014", 0.0028", 0.0042", or thicker electrolytic or rolled copper foil on one or both surfaces. Other metal foils and other resin-and-base combinations can be supplied on special order.

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THE PLASTISCOPE*

NEWS AND INTERPRETATIONS OF THE NEWS

By R. L. Van Boskirk

Alpha Methyl Styrene Available

FAIRLY large quantities of alpha methyl styrene are now available from Hercules Powder Co.'s new cumene process plant in Gibbstown, N. J., where it is manufactured as a co-product of phenol, acetone, hydroperoxides, and acetophenone.

Alpha methyl styrene has never been available in large quantities. It has been used primarily with polystyrene, but users have not talked much about why they were using it. Hercules will now have several million lb. a year available for those who want to take advantage of its possibilities. It will sell at a price under conventional styrene monomer, which is now 19¢ a pound.

Alpha methyl styrene is somewhat like styrene monomer, but it is slower in reaction and will not homopolymerize with peroxide catalysts. An ionic catalyst must be used to polymerize alpha methyl styrene. Even with peroxide catalysts, however, alpha methyl styrene can replace styrene up to 20% in styrene polymers.

Alpha methyl styrene can also be copolymerized with almost any vinyl, except perhaps vinyl chloride, and is especially interesting as a copolymer with acrylonitrile where it would result in a resin with different properties than the present well known styrene-acrylonitrile copolymers.

When used in polyester resins, alpha methyl styrene reduces the "peak" effect; i.e., the temperature rise during polymerization. It can also be used as the dimer and trimer (double and triple molecules) clear extenders for plasticizers used with vinyl chloride. There is one product already on the market for this purpose which is particularly effective for electrical purposes.

When used with polystyrene, this material will improve heat resistance

to a certain extent. Some chemists also claim that it will improve impact strength of polystyrene up to a certain point, but caution must be used; otherwise brittleness will be increased once that point is passed.

According to patent literature, alpha methyl styrene can also be used to improve the properties of cigaret paper; it finds application in impregnating felt. It can also be combined with phenol to obtain a para substituted alkyl phenol (cumyl phenol) which can be used in paint and varnish resins.

But by and large, its greatest use in the future will probably be as a modifier for other monomers to obtain materials with special properties. Its future is undetermined because there has been an insufficient amount for wide-scale use in the past, but chemists are "high" on its possibilities.

Alpha methyl styrene should not be confused with Dow's vinyl toluene or American Cyanamid's methyl styrene. Both of the latter can be polymerized with a peroxide catalyst just the same as normal styrene, but as pointed out above, that procedure is not possible with alpha methyl styrene. The latter has some of the same properties as methyl styrene and vinyl toluene, but several others such as heat resistance and brittleness factors that are quite different.

Hercules New Phenol Production—Major product of the new Gibbstown plant is phenol to be produced at a 26 million-lb. annual rate which their spokesmen say makes them the largest synthetic phenol producer on the East Coast. This area is in turn the largest consumer of non-captive plant phenol in the country, and from their location near Philadelphia, Hercules can deliver tank trucks of phenol on 24 hr. notice to any location in the lower New England and Mid-Atlantic states areas. Furthermore, such shipments should arrive still in molten form, thus

eliminating the bothersome task of melting before unloading can begin.

When asked further about disposal of their increased capacity for phenol in a market that already seems to have over-capacity, Hercules spokesmen said they expected demand to grow from the 404 million lb. used in 1954 to 600 million by 1960, and that use should double every 10 years. About 200 million lb. of capacity have been added since 1950. Total capacity of the industry is very close to 600 million lb. right now. Among possible increased uses are those for Bisphenol A, needed for epoxies and other purposes and the almost certain increase for shell molding resins. Phenol is also needed in more volume for derivatives used as oil additives. Increased adoption of hydraulic valves in the automotive industry requires better oils.

The Hercules cumene process has received wide publicity as a new development in the chemical industry. Cumene is isopropyl benzene which is the raw material from which Hercules produces the four chemicals named above in one simultaneous operation. The plant is constructed so that either more phenol or several other phenols such as para cresol and other chemicals can also be produced there in either present facilities or new extensions. Among the possibilities is their new Di-Cup (dicumyl peroxide) which is used as a substitute for sulfur in vulcanizing rubber. It is quite possible that more materials for use in plastics will be forthcoming from this new chemical process just as soon as the chemists have had a chance to more thoroughly digest its possibilities.

Vinyl Parade

VINYL chloride is well on the way to becoming the material with more excess capacity than any other plastic, but new producers continue to spring up like violets in the spring. Egged on by the vinyls' tremendous sales upsurge in 1955, by the wide spread between monomer and polymer prices which once existed, and by the tempting but uncertain bait of vertical integration, there are still numerous enterprisers who want to blossom in the vinyl garden. Apparently they have no fear of today's over-capacity, of rapidly growing foreign production, nor of the threat of further price reduction implied

* Reg. U. S. Pat. Off.

Kroehler's merchandising division discusses a fresh new look in furniture

"Plastics molded by General American helped us create a revolution in furniture"

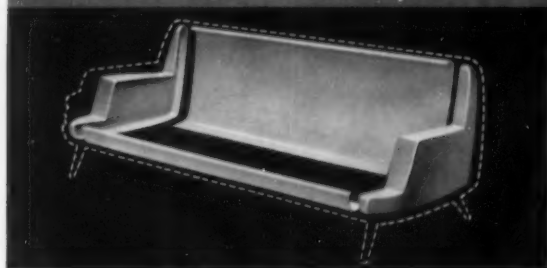
"Make it different . . . make it better . . . all the way through."

"That's what our salesmen told us . . . and that's what we did. We thought about new ways of building furniture—and we took our problem to General American. We found we could have reinforced fiber glass molded into a strong shell-like frame by General American's Plastics Division . . . that they could apply tough, easy-to-clean vinyl directly to the fiber glass to form a durable, good-looking covering.

"We discovered that this new construction gave us complete freedom in designing furniture. We used luxurious fabrics and foam rubber padding to create upholstery as comfortable as it looks. As a result, this new furniture, we found, was not only new in design, but has great strength, is easy to care for (washable, fadeproof and scuff-resistant), attractive in appearance and wonderfully comfortable to use . . . thanks to contour molding.

"Soon, you'll be seeing Kroehler's 'Revolution in Furniture' (under the Valentine-Seaver label) in your favorite store windows. Look it over. You'll like it."

it pays to plan in plastics molded by General American



. . . And this is the reinforced plastics frame



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when prices were recently dropped 7¢ a pound.

Latest entrant into this field is Thompson Chemical Co. of Pawtucket, Rhode Island, which has hired Scientific Design Co., Inc. of New York to build a polyvinyl chloride plant for them at Taunton, Mass. The capacity of the plant has not been announced.

Thompson was organized in the 1920's and bought by its present owners in 1945. The original products were polishes, cleaners, and other materials for the automotive industry. The only automotive products now produced are brake fluids, anti-freezes, and packaged oil. For the last three years the company has been marketing plasticizers, plastisols, and compounded vinyl chloride, particularly for wire coating applications. A. T. Polvan is president of Thompson.

The company's largest customer is Apex Tire & Rubber of Pawtucket. Apex is owned by the same officials who control Thompson. Apex produces wire coating material, garden hose, and composition soles for shoes.

Lightweight Mat

CHOPPED fibrous glass bonded mats in a weight range from ¼ oz./sq. ft. to 6 oz./sq. ft. are now being supplied by Marmyte Corp., 500 McKinley Ave., Mundelein, Ill. It is believed that this is the first time that commercially usable bonded mats as light as ¼ oz./sq. ft. have ever been offered to the trade. They are suggested primarily for such applications as corrugated and flat glazing, boats, and similar structural types.

Loom-to-Laminate

GLASS yarn that can be woven into cloth which requires no heat-cleaning or after-treatment before it is used in a laminate will soon be put on the market by one of the glass companies. This direct loom-to-laminate operation should be of great benefit to the reinforced plastics industry people who have always muttered unpleasantly about the necessity for heat-cleaning and ap-

plying a finish to fibrous glass cloth in order to obtain a good bond between resin and cloth. The new glass yarn should also help to guarantee a more uniform finish throughout the fabric.

Cycolac

PRICES for Cycolac resins produced by Marbon Chemical of Gary, Ind., have been reduced 10 percent. The price of natural is now 58¢ a lb. in 20,000-lb. lots or more.

National Plastics Exposition

ANNOUNCEMENT has been made that the Seventh National Plastics Exposition will be held from June 11 to June 15, 1956 at the new Coliseum in New York City. This will be the first time in eight years that this industry-sponsored exposition, to be presented by The Society of the Plastics Industry, Inc., will be held in New York.

A conference on plastics will be held at the same time, featuring talks on new markets for plastics products and discussions on future applications for plastics.

Chairman of the committee planning the exposition is William C. Conroy, sales manager of Erie Resistor Corp., Erie, Pa.

Monsanto-Lion

THE boards of directors of Monsanto Chemical Co. and Lion Oil Co. have signed an agreement of merger for the two companies.

A spokesman pointed out that more than half of Lion's investment and earnings are in chemicals. In addition to petroleum, Lion is a producer of nitrogenous chemicals—ammonia and its derivatives. Monsanto is a substantial consumer of ammonia and also a large producer of phosphorus and combines the two in phosphorus fertilizers.

Moreover, it is noticeable that in addition to the combined agricultural interests of the two companies, Lion has large resources of oil and gas, and more than one half of Monsanto's raw materials are products which can be or are now being produced from petroleum fractions or from natural gas.

In the first six months of 1955, Lion sales were \$50 million and Monsanto's were \$203 million; Lion's earnings were \$8 million and Monsanto's were \$16 million. Lion has about 3000 employees and Monsanto, almost 15,000. The annual payroll in 1954 for Lion was about \$15 million and for Monsanto about \$78 million. The total assets of both companies will be about \$550 million.

The identity of the Lion organization will be continued and it will be known as Lion Oil Co. a Div. of Monsanto Chemical Co., headed by T. M. Martin.

Curing Agent for Epons

DEVELOPMENT of a new curing agent for use with Epon resins has been announced by Shell Chemical Corp., 50 W. 50th St., New York 20, N. Y. Designated as Epon Curing Agent BF3-400, the product is a solid at room temperature, yet is easily stirred into warmed Epon 828 to yield catalyzed mixtures which remain usable up to several months when stored at room temperature.

The company also states that these mixtures have long pot lives at the moderately elevated temperatures that are frequently desirable for obtaining practical working viscosities. When cured, the catalyzed mixtures yield products with chemical and heat resistance better than that of similar products cured with aliphatic polyamine curing agents.

Nafil Resin and Catalyst

USE of its Nafil resin and Nafil catalyst in the manufacture of foamed-in-place polyurethane foams has been announced by Chase Chemical Corp., 3527 Smallman St., Pittsburgh 1, Pa. When resin and catalyst are mixed together, the resin is claimed to foam to as much as 30 times its original mass, depending on the density of the foam desired.

Nafil foam is reported to have excellent adhesion to almost any surface, including damp surfaces. Considerable savings are claimed for Nafil foams when used to insulate irregular, damp, or inaccessible surfaces.

The material can be sprayed or poured. The foam has acoustical, cushioning, insulating, sound deadening, and structural reinforcement properties. It is especially useful in

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REINFORCED PLASTICS MOLDING



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Di-iso Decyl Phthalate is the most permanent phthalate plasticizer commercially available.

This recently developed phthalate plasticizer makes it possible for you to substantially increase the life of your vinyl products . . . at a volume cost less than that of Dioctyl Phthalate. In severe aging tests (120 hours @ 121°C. and 96 hours @ 136°C.) the results for Di-iso Decyl Phthalate indicated only about one-half the loss of flexibility of plastics containing Dioctyl Phthalate.

Di-iso Decyl Phthalate is a primary plasticizer for most resins. It is recommended for any composition where it is desired to have the all-around good properties of Dioctyl Phthalate with longer lasting flexibility.



Technical literature and samples will be sent immediately upon request without obligation.



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the air conditioning, construction, insulation manufacturing, metalworking, refrigeration, and transportation fields, when a material having one or more of these properties is needed.

Cast Sheets

FORMATION of Polycast Corp., 69 Southfield Ave., Stamford, Conn., as a supplier for cast plastic sheets, rods, and tubes has been announced. The company is currently producing optically clear sheets in a number of different plastic materials, including cast methyl methacrylate.

In addition to the manufacture of cast plastic sheet material, Polycast is setting up a fabrication department to manufacture custom products from the thermosetting materials not ordinarily handled by regular fabricators.

The special technical abilities of the firm have been developed by its founder and president, John O. Beattie, who has been working exclusively in the field of cast plastics since 1945.

At present, cast plastic sheet material is available in thicknesses from 0.040 to 1 in. in the following materials: CR-39—a thermosetting cast resin of good optical clarity and abrasion resistance; methacrylate—tough, clear, easily formed to radical curves; polystyrene; Polycast 1—resembles methacrylate, but will not craze when domed into shapes such as watch crystals or canopies; Polycast 2—a high-temperature version of CR-39 that is highly resistant to heat and chemical attack; Polycast 3—a resin possessing much of the abrasion resistance of CR-39, but easier to form; and Polycast 4—an ultra-high-frequency material for use in electronics.

Organic Peroxides

A NEW source of organic peroxides for industrial consumers is available from Specialty Chemicals, Inc., Burnet Rd. at Aero-Tel Airport, Austin, Texas.

Dr. P. S. Bailey, professor of chemistry at the University of Texas, assisted in the development of a novel process for the manufac-

ture of the first product in the line, methyl ethyl ketone peroxide, and will continue to serve in an advisory capacity. Dr. Bailey recently returned from Germany where he was associated with Professor R. Krieger, who is noted for his work in the field of organic peroxides and ozonides.

Barrett in Thermoplastic Field

A THERMOPLASTIC sales group, under the direction of H. A. Voskamp, Jr. has been formed by Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York, N. Y.

Director of sales for plastics and resins, Carleton Ellis, Jr., states that polyethylene lubricants and nylon molding compounds will comprise the initial entry in the thermoplastics field, with both products marketed under Barrett's Plaskon trademark.

Newbury Injection Machines

PURCHASE of the Mini-Jector line of 3/4-oz. injection molding machines from Moslo Machinery Co., Cleveland, Ohio, has been announced by Newbury Industries, Newbury, Ohio.

Newbury Industries, for many years a pioneer in the development and manufacture of precision scientific instruments, announces a long-range development program devoted exclusively to injection molding machines of 1-oz. capacity or less. The firm has already adapted the Mini-Jector model for use with either hydraulic or pneumatic power. Also projected is a 1-oz. production machine for the manufacturer or molder whose production is widely diversified but of short run.

Moslo's president, Ernest P. Moslo, has informed owners of Mini-Jectors to order parts from Newbury and address all communications regarding their present machines to them.

Film and Paper Laminating

LAMINATING and coating equipment, capable of producing roll or sheet widths up to 54 in., has been installed by Gomar Mfg. Co., 79 Paris St., Newark, N. J.

The new equipment, according to Paul Marks, president of the company, will be used almost exclusively for custom production to specification for the packaging and other industries. The machine turns out roll or sheet in gages from 0.00025 in. upwards, and "will laminate almost anything to anything."

The company, Mr. Marks states, is now ready to accept orders for such laminated products as foil bonded to plastic or paper, plastic to plastic, polyethylene to cellophane, vinyl to cloth, etc.

Coating operations that can be performed include coating plastic and foil with heat-sealing adhesives.

Tooling Seminar

A SEMINAR on the application of plastics to tooling is being conducted weekly by the New England Seminar of Tooling, P. O. Box 857, Edgartown, Mass. Those wishing to enroll in either the four-day, compacted program or the nine-day session may do so by writing to the New England Seminar of Plastic Tooling.

The four-day program is designed to meet the requirements of those desiring a working knowledge of the basic elements of making tools from plastics. Participants will handle each of the most commonly used materials in general exercises portraying standard procedures.

New sessions start every Tuesday. Applications should indicate at least three choices of starting dates as attendance is limited to assure individual attention.

Nominally priced, the cost of the four-day program is \$150.00; the nine-day session, \$275.00 plus materials used. Continued sessions cost \$25.00 per day.

Nylon Coating

A NYLON solution, called Nycote, which is available in solid nylon content from 1 to 15%, has been announced by Nycote Laboratories, 15002 Delano St., Van Nuys, Calif. The Nycote formulation has long shelf life (tested for 18 months) and does not have the tendency to gel, which sometimes is evident with nylon solutions. The product forms a tough coating with extreme resistance to abrasion, impact, and weather.

Nycote is used as a protective coating over high-test fuel tank

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sealants and sealants in pressurized compartments; it can also be applied to certain glass laminated products to prevent absorption of oils, fuels, hydraulic fluids, and moisture, as well as a protective coating to both inside and outside surfaces of hydraulic hose assemblies. In diluted solution as a saturant for cotton fabrics, Nycote materially increases wear and dirt-resistance.

The company states that several new applications are now being considered, with test now being conducted or contemplated in the very near future. One test is for the protection and sealing of concrete flooring; the protective coating eliminates penetration of oils, lubricants, fuels, battery acids, and water into the concrete itself.

Another test concerns protection from rain erosion. Because of the toughness and resiliency of Nycote, it is believed that the product will serve as a protection to glass laminates, metals, etc.

Experimental tests indicate an excellent future for the coating of various types of films for the packaging industry.

Nycote is also reported to have potentially wide application as a protective coating for painted and untreated metal surfaces; plastics, glass fabric, or mat laminates; and cotton, nylon, and rayon textiles.

The coating may be applied with brush, spray gun, or by dipping.

Reinforced Plastics Meeting

ANNOUNCEMENT has been made that the Reinforced Plastics Div. of The Society of the Plastics Industry, Inc., is organizing a technical symposium on the long-time strength properties of these materials for its February 1956 meeting in Atlantic City, N. J.

Authors who wish to offer papers, should submit abstracts of about 50 words as soon as possible to C. R. Stock, American Cyanamid Co., Stamford, Conn.

Lubricant

DEVELOPED by Advance Solvents & Chemical Corp., 245 Fifth Ave., New York 16, N. Y., Advawax 280,

an internal lubricant and anti-blocking agent for vinyl sheeting, rigid vinyls, and other resins, is a new, hard, high melting point synthetic wax resembling carnauba wax.

The wax remains in a fine suspension within the plastic and during extrusion, calendaring, or molding, it migrates to the surface, and provides a smooth, glossy surface. Advawax 280 does not affect the color or clarity of the plastic.

Advawax 280 is also recommended for use in mold release compounds.

Stabilizer Name Change

A STABILIZER, heretofore trademarked Stabilite, has now been designated as Merix AST Concentrate 1001 by Merix Chemical Co., 1021 E. 55th St., Chicago 15, Ill. The name was changed because of the presence of other products with similar names on the market.

Isothane for Foaming

A TWO-PACKAGE system of isocyanate foaming resins has been developed by Surface Chemicals, Inc., McKees Rocks, Pa. Marketed under the tradename of Isothane, the two-component polyurethane system is applied by spraying or pouring, can be used for coating surfaces and filling voids, and can be expanded to densities of from 3 to 15 lb./cu. foot.

The company claims that Isothane has good adhesion to all types of surfaces, excellent impact and vibration resistance, good dielectric properties, and chemical resistance. The resin has practically no water absorption properties. One of the material's outstanding features is that no costly steam lines, molds, heat, or pressure of any kind are required to foam the plastic. The basic foaming resin and catalyst are premixed in proper proportions through special metering equipment. The mixture leaves the blending nozzle and expands within the area into the final foamed resin.

Among the possible applications for Isothane are thermal insulation, acoustical insulation, fillers for cavities and voids of all types, and a shockproof packaging material for

fragile instruments and glassware. It is also said to be a good stiffener for sandwich construction. The resin's high buoyancy and water resistance indicates its use for lightweight pontoons, life rafts, and similar equipment.

A technical bulletin on Isothane, listing properties and application methods, may be obtained from Surface Chemicals.

World Plastics Fair

AN INTERESTING feature of the World Plastics Fair, to be held in Los Angeles, Calif., from October 5 to October 9, will be displays of applications according to end use. There will, of course, also be the traditional exhibits by chemical, resins, and tool companies.

A style show will feature plastics in the world of fashions. Other exhibits will include a modern home furnished in plastics. The United States Dept. of Commerce will present an export-import exhibit designed to aid plastics manufacturers build foreign trade.

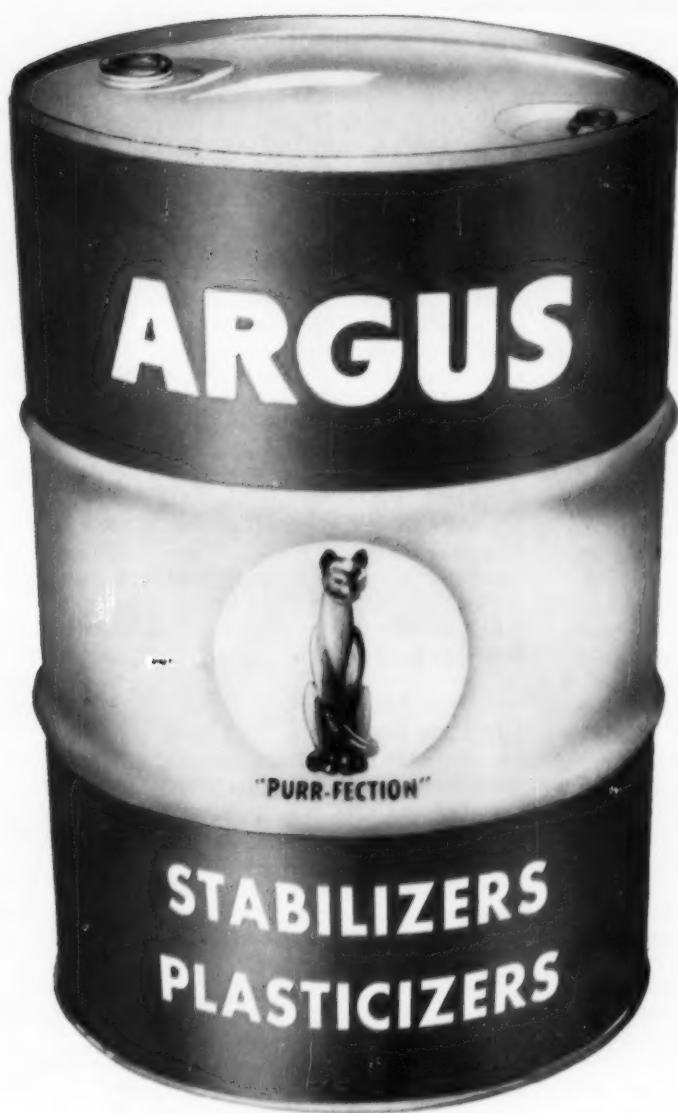
World premiere of the first motion picture (color), filmed with an elliptical acrylic lens, will be shown. Produced by Jan deSwart, Los Angeles engineer, the film will be exhibited on a regular twice-daily schedule during the five-day period of the Fair.

Metallized Ethyl Cellulose

METALLIZED ethyl cellulose, one of the toughest and most stable of the celluloses, is now available from Coating Products, Englewood, N. J. This is the fifth addition to the company's line of Mirro-Brite metallized plastics. The other materials are acetate, butyrate, polystyrene, and Mylar.

Mirro-Brite ethyl cellulose is claimed to be suitable for vacuum forming as well as for other applications. In comparison with sheet acetate or butyrate, the new material has a considerably greater tensile strength, allowing formers to use a thinner gage. Standard gages are 0.0075, 0.010, 0.015, and 0.020 inch.

The ethyl cellulose exhibits characteristics making it particularly suitable to the vacuum forming process, according to company spokesmen. It stretches and draws without strain marks or blushing. Ability to consistently make good pieces with a very small waste factor represents a big saving to the



ARGUS CHEMICAL CORP.

REPRESENTATIVES: H. M. Royal, Inc., 4814 Loma Vista Ave., Los Angeles
Philip Bros. Chemicals, Inc., 176 Federal St., Boston
H. L. Blachford, Ltd., 977 Aqueduct St., Montreal

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user. In those cases where the material is to be lithographed or screened before forming and registry of the finished item is important, ethyl cellulose is claimed to be superior to other materials.

Ethyl cellulose was added to Coating Products' line in response to the increasing demand for a more stable, transparent sheet for use in displays, packaging, and similar fields. The material is available in 24-in. rolls or cut-to-size sheets.

Plandex Reprocessing

PROPER reprocessing of plastic scrap is of prime importance to the industry. The expanded facilities of Plandex Corp., Downingtown, Pa., are dedicated exclusively to that purpose, on a custom basis.

Plandex does not own a single pound of scrap, even though thousands of tons are being reworked constantly in its plant. Assigned lot numbers identify each customer's material and a regular 30-min. check for quality by laboratory technicians assures production in accordance with the specifications of the customer. Regular procedures include molding tests; material analyses; color matching and blending; microscopic slide tests; and reprocessing specifications.

The company is now operating in its new plant in Downingtown, after years of developing its techniques in smaller quarters in Norristown, Pa. The new plant is completely equipped with specialized machinery, much of which was custom built to Plandex' specifications by Welding Engineers, Inc.

Because of the importance of cleanliness in the reprocessing of such sensitive materials as plastics, an auxiliary department with controlled atmosphere is integrated in the Plandex production line. Compounding, straining, and pelletizing is completed in this specialized air-conditioned "building within a building." The operations are constantly under quality and quantity control.

Customers are immediately informed of any weight or quality discrepancy between shipping advices

and condition or weight of materials upon arrival at the Plandex plant. Visual and manual sorting before processing serves as a further check on quality and quantity, the results of which become a record with each lot.

Plandex has ample facilities for all plastics scrap reclaiming—high power sawing and grinding to reduce large scrap to proper feeding sizes, coloring and blending equipment, self-loading bagging, multiple-unit dual worm compounder-extractor-extruders, and testing and engineering laboratories. The plant is located within minutes of the Pennsylvania Turnpike system, Lincoln Highway, U.S. No. 1 and U.S. No. 202, and has direct railroad sidings.

Richard Elliott, vice president, is in charge of operations.

Bigger Panels

WHAT is claimed to be the largest decorative plastic laminate panels in the plastics industry are being manufactured by Consoweld Corp., Wisconsin Rapids, Wis. Measuring 12 ft. by 51 in., the jumbo-size panels are designed to cover large wall areas with fewer panels, which cuts down the number of joints and results in more attractive jobs at reduced labor costs. Standard panel length in the industry is said to be 10 feet.

The new 51-in. width panels will enable dealers and distributors to cut 25½-in. sheets for standard counter tops, which eliminates waste found in other widths. The 12-ft. length permits cutting all standard sizes from 3 to 9 ft. long without waste.

The company states that the panels are particularly adaptable to commercial and institutional installations for larger areas and higher ceilings. The panels are available in 46 patterns and colors, including marble and wood grains.

PLASTICIZER NEWS

Chlorinated Plasticizer—A low-viscosity secondary plasticizer for compounding polyvinyl chloride

resins has been developed by Diamond Alkali Co.'s Chlorinated Products Div., 300 Union Commerce Bldg., Cleveland 14, Ohio.

Designated as *Chlorowax LV*, the new material is a modified liquid chlorinated hydrocarbon which provides substantially lower viscosity than normal 40% chlorinated paraffins. Approaching that of primary plasticizers in present general usage, the viscosity of *Chlorowax LV* falls in the 5-poise range at 25° C., facilitating easier plant handling of this plasticizer.

Other important advantages of the material, according to the manufacturer, are improved fluidity, tending to give flexible plastics better physical characteristics at low temperatures; and greater stability, an important aid in processing which improves aging characteristics of products. *Chlorowax LV* is described as being odorless, non-toxic, and non-flammable.

Price Reduction—Reduction in the price of *KP-90*, an epoxy plasticizer, has been announced by Ohio-Apex Div., Food Machinery and Chemical Corp., Nitro, W. Va. The new price is 40¢ a lb. in tank car quantities, and the standard differentials for lesser quantities.

KP-90 is a primary plasticizer for vinyls, nitrocellulose, polystyrene, ethyl cellulose, synthetic rubbers, etc. It imparts low-temperature flexibility, good heat and light stability (claimed to reduce the amount of metallic stabilizers), and good hand and drape.

National Lead's New Plasticizers

—Three new plasticizers—*NL-F22*, *NL-F32*, and *NL-F33*—are now being marketed by National Lead Co., 111 Broadway, New York 6, N. Y., according to an announcement by the company.

The plasticizers, which exhibit an unusual combination of properties, impart improved flexibility at reduced temperatures and are very low in volatility at elevated temperatures. Articles containing one of the new plasticizers will remain flexible and handle easily under very cold conditions, as well as retain their strength when subjected to higher temperatures.

NL-F22, a normal phthalate-ester of the semi-polymeric type, costs 36¢ a lb.; *NL-F32*, a mixed alkyl,

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| JOHN H. BEACH 735 Powers Building Rochester 4, N.Y. | ELIOT JACKSON Riverside Drive Riverside, Conn. | |

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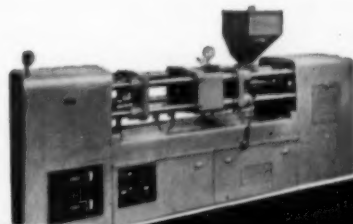
* LOOK Magazine photo

LOOK reports in the January 25 issue under the heading, "What's behind the German comeback?":

"Carl Gisbert Siebel . . . a hustling industrialist . . . thinks the best defense against communism at home is to give workers a high standard of living. He has helped build houses for his own employees, and the company has its own pension plan in addition to federal social-security benefits . . . He has had no labor trouble; disputes are ironed out at monthly meetings with union representatives."

And C. G. Siebel adds:

We at the firm of F. Sommer claim we are building today the injection molding machine of tomorrow. I can tell you why. No suggestion, whether from the plant or from a customer, ever goes unheeded. That American principle seems to me more precious even than the \$3 billion that you people poured into Germany after the war. And for us in my plant the result is complete adaptability — both of our molding machines and of our precision molds, which are turning out high-quality work in more than one American shop. If you use machines between 1 1/2 and 12 ounces, let me tell you about ours; plug into any socket and they're ready to go. And with their fully hydraulic oil operation, you won't know what a breakdown is. Just write — no obligation, of course — to:



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C. G. Siebel, President

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adipate, sells for 42½¢ a lb.; and *NL-F33*, an alkyl adipate ester complex, costs 41½¢ a pound.

The plasticizers will find particular application in furniture upholstery for both indoor and outdoor use; film and sheeting for raincoats, wading pools, curtains, and tablecloths, and flooring compounds.

The company is also placing on the market high purity di-decyl phthalate (*NL-A40*) and octyl decyl phthalate (*NL-A50*) plasticizers, which will sell for 30½¢ a pound.

Swift Announces New Plasticizer—First in a series of plasticizers to be produced by Swift & Co.'s Industrial Oil Dept., 1800 165th St., Hammond, Ind., is *Esterflex B-1*, a new type of general-purpose primary plasticizer for polyvinyl chlorides.

EXPANSION

Hercules Powder Co., Inc. is constructing a new plant for the production of pentaerythritol (PE) at an investment of approximately \$6 million. Completion of the plant, scheduled for late 1956, will make Hercules the largest producer of PE and will double the company's present annual capacity.

Located in the Midwest, on the site of an existing Hercules anhydrous ammonia plant in Louisiana, Mo., the plant will have an annual production capacity of 24 million lb. of PE and 100 million lb. of formaldehyde, a basic raw material for PE. Hercules will continue to produce anhydrous ammonia at the plant at the current rate of 40,000 tons a year for agricultural and industrial users.

The new plant will incorporate all of the latest developments in process and equipment which have grown out of the company's operations in Mansfield, Mass. Hercules' first PE plant, in operation since 1943 and now producing approximately 24 million lb. of PE annually.

Hercules bought the government-owned Missouri Ordnance Works in Louisiana early in 1954, and by June 30 of that year had started production of anhydrous ammonia,

naming its new plant the Missouri Ammonia Works.

American Agile Corp. has added over 10,000 sq. ft. of manufacturing and research space to its present facilities at 5461 Dunham Rd., Maple Heights (Cleveland), Ohio. The new addition will nearly double the existing plant facilities.

Agile services the chemical, food, electrical, and metalworking industries with such items as self-supporting, non-corrosive tanks; fume exhaust systems; fume scrubbers; non-toxic tanks and vessels; non-breakable laboratory ware; and a wide variety of shapes, such as sheet, rod, tubing, etc.

Agile claims to be the first company to make irradiated polyethylene commercially available.

Dr. J. A. Neumann, president, states that the company's business during the first six months of this year equalled nearly 90% of its entire 1954 sales volume, Agile's previous record year.

The present Agile facilities are situated on a 1½-acre site in suburban Cleveland; additional land is still available for another building expansion set for 1958.

The Borden Co.'s Chemical Div. announces that as a result of the completion of a new building and installation of new equipment at its Monomer Dept.'s plant in Leominster, Mass., the company has tripled its output of all grades of Lemol polyvinyl alcohols.

The various grades of Lemol produced at the new plant are used as emulsifiers and stabilizers in the formulation of adhesives, paper coatings and saturants, and textile sizings and finishes. They also serve as binders for films, fibers, and molded products. An important by-product of the plant is methyl acetate, used as a lacquer solvent, paint remover, and metal cleaner.

The company states that current shortage of certain grades of the polyvinyl alcohols will be alleviated by the expansion. Particular emphasis is being placed on the production of Lemol 75-98, polyvinyl alcohol with the highest available

viscosity on the market today. Also in full production are Lemol 5-88, Lemol 22-88, and Lemol 42-88, all partially hydrolyzed grades of the alcohol being used by polymerizers of polyvinyl acetate emulsions. For compounders wanting non-gelling, non-aging grades of polyvinyl alcohol, the plant is producing GF-60. Lemol 65-98 and Lemol 60-98 are being produced for those wanting the gelatinous types.

Celanese Corp. of America will start construction of the first unit of a new chemical manufacturing plant at Gallipolis Ferry, five miles south of Point Pleasant, W. Va. The plant, to be built on a 412-acre site, will produce plasticizers for the coatings and plastics industries; fire-retardant hydraulic fluids and compounds for the automotive, aircraft, and other industries; and a range of intermediate products for general industry. Among the products to be made at the new plant will be tricresyl phosphate, which was originally developed and produced by the company in 1914.

Production operations are expected to start in April 1956.

National Starch Products, Inc. has started operation of its second polyvinyl acetate resin plant in Meredosia, Ill. While the prime function of the new plant will be to produce polyvinyl acetate emulsion, the company also plans to manufacture adhesives containing large proportions of the vinyl emulsions for its National Adhesives Div.

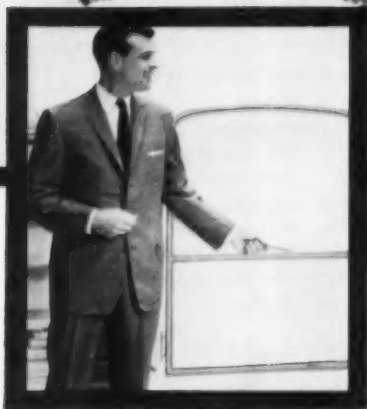
National Starch also announces that construction has begun on an addition to the present Alexander Research Laboratories in Plainfield, N. J. **Frank Greenwall**, president of the company, states that the additional construction to the research laboratories is one of the steps in National's recently announced \$3.5 million company-wide expansion program.

Plans for the combined laboratory call for a one-story structure, on an 8-acre tract. National's intention is to centralize and integrate their research, development, and technical staff of over 150 persons into this one center.

The Borden Co.'s Chemical Div. announces the opening of its new plant in Browntown, Wis., the first in Wisconsin to produce liquid urea,

Another Monsanto First!

New vinyl compound
OPALON* 75219
is non-migratory, too!



Pastel colored vinyl welting made of Opalon 75219 now in service on refrigerator door. Inspection shows no sign of plasticizer migration.

Extruded vinyl welting provides a perfect gasket for refrigerator doors. It needs no vulcanizing. It has an attractive color range. It is grease resistant. But used with styrene door liners, ordinary vinyl gaskets make trouble. The plasticizer migrates from the vinyl into the styrene, causing the component to soften or deteriorate.

Could something be done? A leading manufacturer of refrigerators brought the problem to Monsanto. And Monsanto chemists created a new vinyl chloride compound with non-migratory types of plas-

ticizer and a specially selected fungicide.

This new compound—Opalon 75219—was designed for regular production extrusion of trouble-free refrigerator door gaskets.

Scores of other extrusion or injection molding applications are awaiting exploitation. Vinyl and styrene can now be used in physical contact. Styrene will not leach out the vinyl plasticizer from Opalon 75219.

For data, write Monsanto Chemical Company, Plastics Division, Dept. MP-9 Springfield 2, Mass.



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phenol, and resorcinol formaldehyde resins in commercial quantities. Designed for initial production at the rate of more than 1 million lb. a month, the plant will supply adhesives to the wood industry and wet-strength resins to the paper industry in the midwestern area.

The plant will also produce liquid and dry catalysts, label pastes, cements, and other chemical specialties. In addition, it will serve as a warehouse for the other chemical and adhesives items made by the division.

The new facilities at Browntown, near the Illinois border and about 50 miles southwest of Madison, will be Borden's eighth chemicals factory in the United States.

Foster Grant Co., Inc., Leominster, Mass., is spending upward of \$300,000 in added facilities for production of polystyrene. Expansion in the polymerization plant is designed to keep pace with the increased output of styrene monomer by the company's Baton Rouge, La., styrene plant, additions to which were announced several months ago.

St. Regis Paper Co.'s Panelyte Div. announces a half-million dollar expansion program which will increase substantially its injection molding and vacuum forming production capacity. The Panelyte plants which will participate in the expansion are the Cambridge-Panelyte Molded Plastics Co. plants in Richmond, Ind., and Cambridge, Ohio, as well as the Panelyte Vacuum Forming plant in Richmond Ind. Production of injection molded parts is expected to be increased approximately 40%, according to Panelyte.

Garfield Mfg. Co., Garfield, N. J., pioneer in cold molding since 1908 and claiming to be the largest cold molder in the world, announces the recent modernization and expansion of its plant.

After recent alteration and modernization of its cold molding facilities, the capacity of Garfield's large hot molding plant has now been increased by the addition of a com-

plete line of new transfer presses, ranging from 50 to 300 tons, new electronic equipment for pre-heating, and preforming and finishing machinery. The company states that the new equipment equals the 500-ton capacity hot molding facilities now in operation.

Alsynite Co. of America, San Diego, Calif., producer of fibrous glass-reinforced plastics panels, announces that franchise arrangements have been concluded with **William C. Steanes**, chairman and managing director of **W. J. Manufacturing Co., Ltd.** of Australia, and five other Australian firms in the engineering and laminates fields. The company will be known as Alsynite of Australia.

A new 10,000-sq. ft. plant, located at Manly on the west side of Sydney Harbor, has recently started its pilot run and plans to produce 500,000 sq. ft. of panels a year on one shift. As demand increases, the company expects to build additional units in space ample to triple production.

Founder of the Plastics Institute of Australia, Mr. Steanes has more than 25 years of experience in plastics.

Bakelite Co., a Div. of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y., plans to expand production of vinyl acetate resin latex, base resin of paints and coatings for interior or exterior use.

Bakelite has projected plans to scale up production of vinyl resin latex WC-130 by more than three times immediately, with future plans for expansion in the next five years.

Plastic Products Corp., 24001 Aurora Rd., Cleveland, Ohio, has started construction of an additional 6000 sq. ft. of floor space to its present plant.

The company manufactures polyester-fibrous glass items, such as flower boxes for indoor and outdoor use, as well as serving trays. Plastic Products also produces custom-molded items for other manufacturers.

Prex Corp., Chicago, Ill., announces that **Wyman-Gordon Co.**,

Worcester, Mass., has purchased a substantial interest in the Prex organization. With the additional funds made available to Prex, plans are being formulated for the construction of a new plant on land already acquired in Franklin Park, northwest of Chicago. The company's present facilities, including those of its **Midland Die & Engraving Div.** (formerly known as Midland Die & Engraving Co.), will be moved to the new plant and will be augmented with additional production equipment.

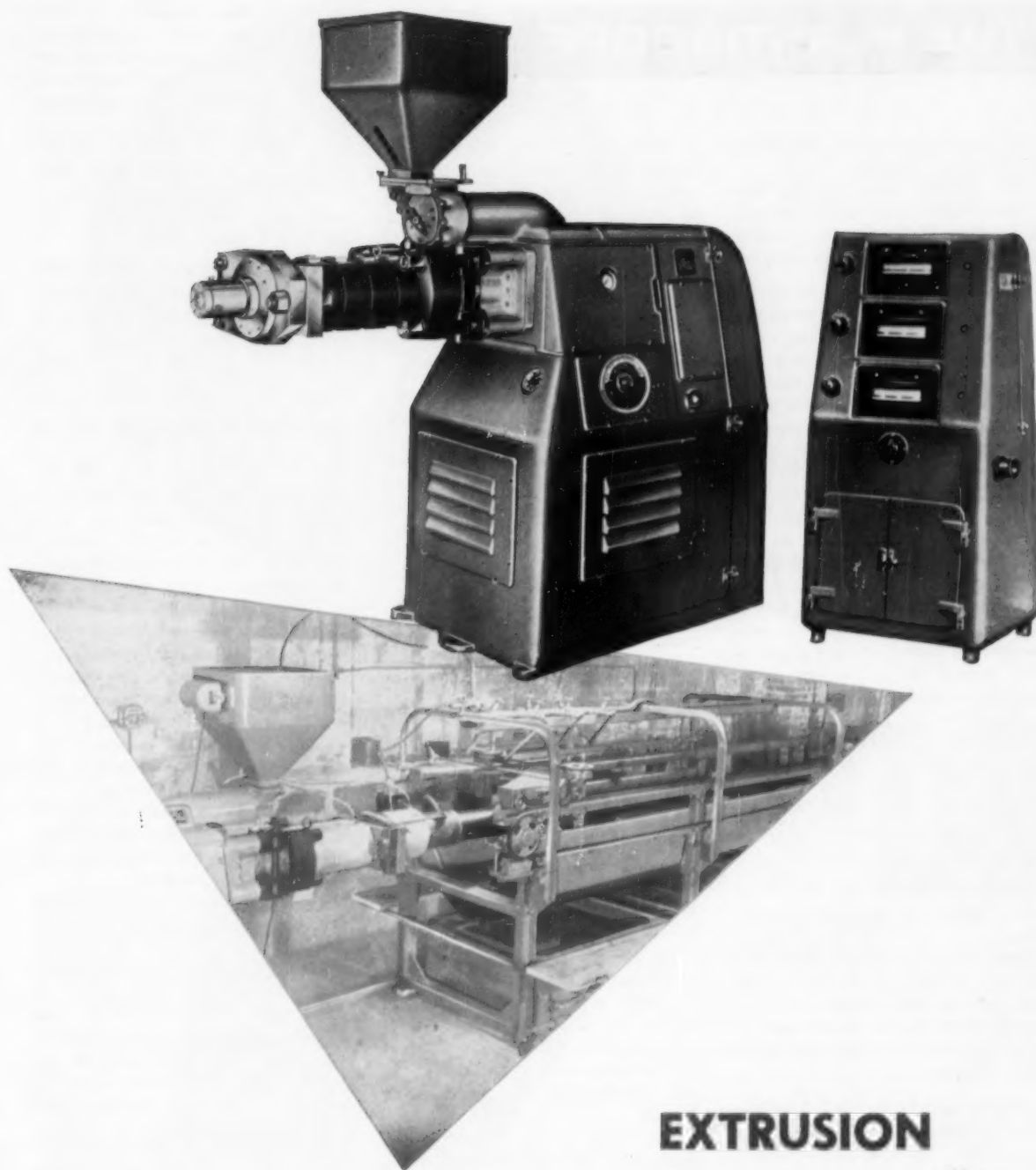
The Midland division manufactures dies for the plastics industry. Its operations will be carried on at the new plant, which is expected to be completed in the fall of 1956.

Prex, originally an outgrowth of Midland Die & Engraving Co., has pioneered the development of small, light alloy forgings without draft and with much thinner sections and closer tolerances than have heretofore been produced.

A. J. Bachner, president of Prex, announces the election of the following officers: **Robert W. Stoddard**, of Wyman-Gordon was elected chairman of the board; **John L. Sekowski**, vice president-general manager; **Paul B. Prough**, vice president; **Larry E. Murphy**, treasurer; **Edward W. Bettke**, comptroller; and **John P. Roche**, secretary.

The Glastic Corp. has moved into a new and larger plant at 4321 Glenridge Rd., Cleveland 21, Ohio. The move will enable the company to double its output of electrical insulating sheet, rod, and molded premix parts. The company states that the 11-acre site provides ample room for further expansion. An enlarged application engineering force is being trained for expanded sales service activity in the field of glass-reinforced plastics.

Shawinigan Resins Corp. has started construction of new million-dollar facilities for the production of Gelvatol polyvinyl alcohol at its plant in Springfield, Mass. The plant, which is expected to be completed by the end of 1956, will have a multi-million-pound capacity, according to Shawinigan. Production of the material will be based on a continuous manufacturing process developed by the firm in cooperation with **Shawinigan Chemicals Ltd. of Canada**, a parent company. Pilot



EXTRUSION

The R.C.100 twin-screw machine is a medium capacity extruder with a nominal output of 100 lbs. per hour and will operate continuously over long periods, producing tubes, rods and sections in thermoplastic materials. Coated cables, rods and tubes are standard jobs.



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plant operations were conducted at Shawinigan Chemicals.

The company also recently announced that a plant will be erected in Trenton, Mich., for the production of Butvar polyvinyl butyral.

The Formica Co., Cincinnati 32, Ohio, announces that the fourth extension of its Evendale plant, since it was completed in 1950, is under way. Company officials state that the main advantage of the expansion to the company and to the customer is warehousing. Formica decorative sheets can now be manufactured ahead of order and stored for immediate delivery.

Part of the new area will be devoted to warehousing raw materials and to extending the manufacturing phases of decorative Formica. It will also release space originally earmarked for manufacturing of industrial grades, which is now being used for decorative application, back to industrial.

To maintain a closer control over raw materials, the company built a separate resin plant a year ago, adjacent to the main plant. Formica now plans to add another kettle to this auxiliary installation.

Lawrence Process Co., Inc., Lawrence, Mass., announces the completion of an expansion in its equipment and facilities for fiber and plastic wetting in the striping, notching, printing, and stitching departments. The company states that the expansion increases its capacity at least 100 percent.

Nopco Chemical Co. Harrison N. J. announces that in anticipation of a 25,000% increase in the demand for foamed plastics in the next five years, the board of directors has established a **Plastics Div.** and authorized a million-dollar expansion program of its facilities and organization. Nopco played a prominent role in the development of rigid urethane foams for military and commercial uses in the United States, according to company officials.

The anticipated increase in demand for these foams is based on

a market analysis by the company during the development period. Currently, there are about 400,000 lb. of urethane foams produced, largely for development purposes. The new foams are expected to pass the 100 million-lb. mark within four years and will not only replace present materials, but will pioneer new products and markets, say Nopco representatives. The potential uses of the foams are of particular interest to such industries as aircraft, guided missiles, and electronic.

Plans call for completion of two plants this year with production capacity of 2 million lb. of both urethane and vinyl foams. One plant will be in New Jersey, the other in Los Angeles, Calif. Nopco is concentrating on a third plant in another location, to be completed next year.

Foamed vinyl is a suitable companion for urethane foams according to Nopco officials who state that experimental projects have already demonstrated that the faults of sponge and foamed rubber are not found in this foamed product. The unusual qualities of foamed vinyl are its great stability, tear-resistance, excellent aging characteristics, abrasion-resistance, and ability to be heat sealed and embossed with excellent results.

The New Jersey plant will include a research laboratory, the engineering and applications division, as well as the facilities for the production of vinyl and urethane foams. Licensing agreements with Lockheed and Mobay are already held by Nopco.

The company also announces the acquisition of **Griffin Chemical Co.**, San Francisco, Calif., producer of petroleum sulfonates, naphthenic acid, emulsifiers, plasticizers, and polyvinyl emulsion. **Everett Griffin**, who organized the Griffin firm in 1935, will be associated with Nopco in an executive capacity on the West Coast.

Sylvania Electric Products, Inc. announces plans for the construction of a 110,000-sq. ft. plastics plant and warehouse in Warren, Pa., for

its **Parts Div.** An additional 9450 sq. ft. of floor space will be added to an already existing building used for the manufacture of lamp bases.

The **Parts Div.** manufactures formed metal parts, cold drawn wire, strip material for electronic tubes, radio tube and fluorescent lamp sockets and bases, plastic closures, tools, dies, and many other electronic component parts.

Ferro Corp.'s Fiber Glass Div. has launched a \$1.5 million expansion program to double its facilities in Nashville, Tenn., and build a new production facility in Southern California. The combination is expected to triple the productive capacity of the division by the end of next year.

The Nashville expansion will result in the establishment of a completely integrated plant for glass fabric production in this country. The plant will be capable of starting with basic glass materials and carrying the fiber process through drawing, twisting and plying, weaving, heat cleaning, and resizing operations to the finished fabric ready for use as a plastic reinforcement. More than 50 weaving looms will be on the line. A sizable portion of the equipment will be engaged in the production of woven roving.

The California plant, similar to the existing Nashville mat facility, will put a glass mat source directly into West Coast markets.

Both Nashville and California facilities will produce the relatively new Ferro-developed Uniformat, including HSB (high solubility binder), a mat which is used for all open-mold, contact-pressure, and atmospheric cure work; GP (general purpose), a mat which uses an insoluble binder and is best suited for matched metal die molding and periodic or continuous dip impregnation systems; and PE (powder and emulsion), a mat produced through a combination of polyester emulsion forming tightly bonded surfaces with a fairly bulky core section.

Melamine-bonded and Silane-sized Uniformats round out the line of fibrous glass mats which will be available from the Nashville and California plants.

Acheson Dispersed Pigments (Texas) Co. will double its production capacity in its plant at Orange, Texas, due to the increased demand



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by the plastics industry in that area for the company's pigment dispersions. New equipment has already been installed.

COMPANY NOTES

New England Tape Co., Inc., Hudson, Mass., announces the election of **Howard M. Wilkoff** as president and treasurer of the company. He succeeds **Sandford Brown**, who has retired. Mr. Wilkoff was one of the company founders in 1936 and a vice president since its inception.

For the past 10 years, Mr. Wilkoff has also been president of **Plastic Sheet Fabrication, Inc.**, 855 Sixth Ave., New York, N. Y., which has now merged with New England Tape and will move its office and factory facilities to Hudson, Mass.

Robert T. Dawes, president of **Thomas Taylor & Sons**, Hudson, Mass., has been elected a vice president and a member of the board of directors of New England Tape.

Barrett Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N.Y., has appointed the following regional agents to handle the sale and distribution of its Plaskon polyester resins: **International Sales Corp.**, Seattle, Wash., will cover Oregon and Washington; **Roy A. Ribelin Distributing Co.**, Dallas, Texas, Texas and Oklahoma.

Phillips Chemical Co., a wholly owned subsidiary of **Phillips Petroleum Co.**, Bartlesville, Okla., announces the following appointments in its recently created **Plastics Sales Div.**, which will handle the company's new Marlex polyethylene: **Walter R. Clark**, formerly affiliated with the market development division of the parent company's Research and Development Dept., has been named assistant sales manager; **R. Vernon Jones** is now manager of technical service and development; and **R. M. Wallace**, who had been on loan to Federal Facilities Corp., Washington, D. C., as chief of the Plant Operations Div., Office of Synthetic Rubber, has been appointed administrative assistant and coordinator of the new division,

headed by **George Walsh**, director and sales manager.

Mr. Jones, in applications research, and Mr. Clark, in market development work, have been closely connected with Marlex through its developmental stages. Mr. Clark, a native of New York City, joined Phillips after serving as general purchasing agent and in various sales capacities for other companies. Mr. Jones has been engaged in applications research on Marlex and other plastics developments. Mr. Wallace joined Phillips' Natural Gasoline Dept. in 1930. Among other assignments in his company career, Mr. Wallace was superintendent of the Plains butadiene plant, superintendent of Phillips Chemical Co., and assistant manager of the parent company's Atomic Energy Div.

The Goodyear Tire & Rubber Co., Inc., Akron 16, Ohio, has established three new sales departments in its Chemical Div.—Plastics, Coatings, and Rubber and Rubber Chemicals. Under the new set-up, **A. E. Polson**, formerly sales service manager, has been named manager of the Plastics Dept.; **John Warner**, previously manager of the division's St. Louis district, has become manager of the Coatings Dept.; **M. J. Rhoad**, formerly assistant to the general sales manager, manager of the Rubber and Rubber Chemicals Dept.

C. O. McNeer, general sales manager of the Chemical Div., announces the following managerial changes: **R. S. Earhart**, formerly sales operating and marketing manager, has been promoted to assistant general sales manager; **P. S. Sherman**, previously assistant operating manager, is now sales operating manager.

Monsanto Chemical Co.'s Plastics Div., Springfield, Mass., announces the following appointments: **Paul Stahlberg** has been named technical service manager of the Polyethylene Resins Dept.; **John C. Garrels** is now assistant general manager responsible for the manufacturing function in the division; and **Carl E. Pfeifer** has become director of manufacturing.

At the Texas City, Texas, plant, **H. K. Eckert** has been promoted to

director of manufacturing, with specific responsibility for Texas manufacturing operations; **J. S. Putnam** has been appointed plant manager.

Frank W. Egan & Co., Somerville, N. J., reports that 12 extruders built by **Bone Bros. Ltd.** of England to the Egan design were sold at the British Plastics Exhibition in London. The extruders range in size from 2½ to 6 in. in diameter.

Sierra Electric Corp. has combined the facilities of five scattered locations at a new location, 15100 So. Figueroa, Gardena, Calif.

Continental Can Co., 100 E. 42nd St., New York 17, N. Y., announces that **Robert E. Woods**, former general manager of General Stores Corp., has joined the company as assistant to **Lawrence Wilkinson**, group vice president in charge of its non-metal division. Mr. Woods will assist with the operations of the fibre drum, flexible packaging, paper container, and crown and cork divisions. He is presently serving as acting manager if the company's recently acquired Vaporized Metal Coatings operation in Roosevelt, N. J. **R. A. Vogt** has been appointed general manager of the **Plastics Container Div.** of Continental's Bond Crown and Cork Div. Mr. Vogt joined the company in 1949, and prior to that, he had been with Sylvania Electric Co.

American Plastics Corp., 342 Madison Ave., New York 17, N. Y., has established a new division for the molding of fibrous glass-reinforced plastics. The division is now producing crash helmets, outdoor sound reproducing housings, chemical trays, etc.

Imperial Chemical Industries (New York) Ltd. announces that its executive offices are now located at 488 Madison Ave., New York 22, N. Y.

PolyPane Packaging Co., Inc., Philadelphia, Pa., announces that **John J. Speese**, Philadelphia attorney, has been elected president of the company. **Eugene L. Keefe** has been appointed to the newly created post of sales coordinator.

PolyPane Packaging Co., a Puerto Rico corporation, produces polyethylene products used in packaging.

Bolta Div., The General Tire & Rubber Co., Lawrence, Mass., has named **Wayne N. Grubaugh** purchasing agent of the division. He

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replaces **Francis Jones** who has been appointed to organize the division's production scheduling department.

Hexcel Products, Inc. is the new name of the company formerly known as **California Reinforced Plastics Co.** All activities conducted under the former name will be continued the same as before under the new corporate name. Future orders and correspondence should be directed to Hexcel Products, Inc., 951 61st St., Oakland 8, Calif. **Roger C. Steele** is president of the company.

Spencer Chemical Co., Dwight Bldg., Kansas City 5, Mo., announces that **H. R. Dinges**, formerly assistant general sales manager, has been named general sales manager. **H. E. Bingham**, who was acting director of product sales, has been appointed general manager of sales services. Mr. Bingham will head the activities of four departments—Sales Development of Agricultural Chemicals; Sales Development of Industrial Chemicals; Traffic; and Advertising. Both appointees will report directly to **J. E. Culpepper**, vice president in charge of sales.

Canadian Westinghouse Co. Ltd., Hamilton, Ont., announces the appointment of **R. W. Stanton Sales Co.,** 2049 Dundas St. West, Toronto, Ont., as representative for its Micarta products. **R. W. Stanton**, formerly associated with Panelyte Div., St. Regis Paper Co., (Canada) Ltd., heads the newly formed sales outlet.

Sindar Corp., 330 W. 42nd St., New York 36, N. Y., has established a Market Development Dept. with **A. T. Fiore** as chief. The company states that the move was made in order to keep the industry informed of the new products and developments resulting from its research programs.

Reed-Prentice Corp., Worcester 4, Mass., has opened sales offices in Buffalo, N. Y., and Los Angeles, Calif., for direct sales of the company's injection molding and die casting machines. **Robert W. Carr** will manage the West Coast sales office at 1213 No. Highland Ave.,

Los Angeles. **C. W. Kendall** will handle the Western New York and Pennsylvania territories from the Buffalo office at 2 Lockwood Lane, Orchard Park, N. Y.

Shoe Form Co., Inc., Auburn, N. Y., announces the purchase of an interest in **United Shoe Machinery Corp.** **Frank DeWitt** remains as president and general manager of the corporation.

Shoe Form manufactures shoe forms, hosiery forms, and plastic boxes for industrial and sporting use.

Cadillac Plastic & Chemical Co. is the new name of the company formerly known as **Cadillac Plastic Co.,** 15111 Second Ave., Detroit 3, Mich. **Robert B. Jacob**, president of the firm, states that the change in name was made to reflect as closely as possible the activities of the company.

The firm was organized in 1946 by **Robert B. Jacob** and **Richard J. Jacob**. Beginning as a plastic supply company and recognized as one of the nation's largest source for semi-finished materials, Cadillac has since branched into manufacturing of plastic resins, adhesives, distilled acrylic, and styrene materials used for the casting of plastic rods and tubes.

The company also announces that **Harry Stephenson**, former sales engineer of Burroughs Corp., has joined its sales organization and will cover the Michigan area.

Pribble Plastics Products, Inc. New Haven, Ind., announces that **C. Todd Clark** will represent the company in the greater St. Louis, Mo., area in the sale of compression and transfer molded parts. Mr. Clark was formerly president of the Society of Plastic Engineers.

The company also announces the addition of warehouse space, a new steam generator, and a 283-ton Logan press in the past few months.

Peerless Plastics has moved into its new 20,000-sq. ft. plant at 400 E. 111th St., New York 29, N. Y.

Aluminum Body Corp. announces the formation of **A.B.C. Plastics, Inc.,** a wholly owned subsidiary. The

principal place of business will remain at 1600 W. Washington Blvd., Montebello, Calif. The plant facilities of A.B.C. Plastics have been moved to 902 So. Vail Ave., Montebello. The company states that the primary purpose of the subsidiary is to supply plastic truck and trailer body parts to the parent company.

Officers of the subsidiary are **L. H. Magor**, president; **R. L. Schall**, vice president; and **J. G. Daudistel**, secretary-treasurer.

Bradley Associates, Inc., 1650-58 N. Damen Ave., Chicago 47, Ill., has purchased the physical assets of **Moldrite Products Co.,** 2000 Walnut St., Chicago. The new enterprise, which Bradley controls, will be operated under the name of **Windsor Molded Plastics Co., Inc.** Bradley's facilities range from 4- to 24-oz. presses. The company will continue to do custom molder work and specialize in plastic boxes.

Argus Chemical Corp., 633 Court St., Brooklyn 33, N. Y., manufacturer of stabilizers and plasticizers, has appointed **H. M. Royal, Inc.,** Los Angeles, Calif., as its sales representative to cover California, Oregon, and Utah.

Nytec Plastics, Inc. has moved to larger quarters at 214 Front St., South Plainfield, N. J., after a fire had completely destroyed its plant in Kenilworth, N. J. The company has included truck and rail shipping facilities at the new plant and is back in full production of extruded nylon in rods from 1/2- to 2-in. diameter, as well as tubes, strips, and tapes of several different nylon formations.

The Rex Corp., Acton, Mass., has opened a warehouse and sales offices for its **Resin-Glas Div.** at 6644 N. Western Ave., Chicago, Ill. The company states that the new facility will make possible faster deliveries and lower prices to fabricators and distributors of Resin-Glas cast acrylic sheet in the Midwest.

J. J. Hourihan Jr., manager of the division, has arranged for a complete stock of Resin-Glas to be maintained at all times so that all sheet sizes and thicknesses will be available in any quantity from the warehouse.

Hy-Art Co. has moved to larger quarters located in the County Federal Savings Bank Bldg., 53 N. Park

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 - 5. SAMPLES** Our sample department will rush a sample to completion for your approval.
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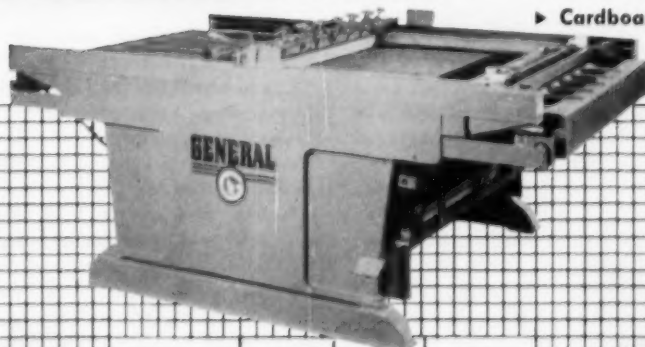
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Investigate these precision built presses for high speed Screen Process printing and decorating rigid sheets. General Decorators combine Production—speed plus simplicity—Quality—controlled inking and sharp printing—and Versatility—a wide range of work on any rigid sheet material. They print on—

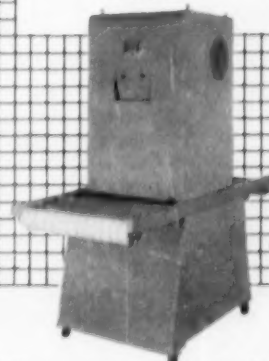
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- ▶ Plywood
- ▶ Wallboard
- ▶ Metal
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- ▶ Ceramics
- ▶ Cardboard



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Ave., Rockville Centre, N.Y. The company also announces that it has been appointed as representative for **Stewart Die Casting Co., Div. of Stewart-Warner Corp.**, Bridgeport, Conn.

Industrial Molded Products Co., Inc., 5201 N. Avondale Ave., Chicago 30, Ill., has established an injection molding department. The company, formed in 1934, has previously limited its activities to hand and automatic molding of thermosetting materials.

Lunn Laminates, Inc., Huntington Station, N. Y., has appointed **Omni Products Corp.**, 460 Fourth Ave., New York, N. Y., as its exclusive overseas agent.

U. S. Industrial Chemicals Co., Div. of National Distillers Products Corp., 99 Park Ave., New York 16, N. Y., has established two new warehousing points in Cincinnati, Ohio, and New Orleans, La., for Petrothene polyethylene resins. The company now has a total of five such points across the country; the others are located in Anaheim, Calif.; Chicago, Ill.; and Jersey City, N. J.

Technical Brands, Inc., Morris Heights 53, N. Y., announces the following appointments in its company and subsidiaries: **Stanley Stutz** has been named vice president, industrial tape sales, **Technical Tape Corp.**; **Walter Kirk**, technical service manager, and **Edmund Decker**, product manager, **Coated Abrasives Div.**; **S. S. Schweitzer**, general manager of **American Tuck Corp.**; **Frederick Kantor**, sales manager of **Electro-Magnetic Products Div.**; and **Myles Vollmer**, product manager, **Polyethylene Div.**, **W. Ralston & Co.**

Witco Chemical Co., 122 E. 42nd St., New York 17, N.Y., announces a major reorganization of its domestic sales force into four regional units, each under the supervision of a resident regional vice president, instead of maintaining its former nine district offices.

The Eastern region will be supervised by **Michael Vacaro**, whose headquarters will be in New York;

the Ohio-Southern region will be under the direction of **Harry M. Brubaker**, with offices in Akron, Ohio; the Midwest region will be headed by **Jerome S. Harrison**; and the West Coast region, which includes all states west of the Rockies, will be supervised by **Stanley M. Freeman**, whose headquarters will be at Witco's new office at 3460 Wilshire Blvd., Los Angeles, Calif.

The company also announces the appointment of **Henry W. Rojas** as vice president of export marketing. Mr. Rojas will be responsible for all present international operations of Witco.

PERSONAL

Walter B. Morehouse has been appointed general sales manager of **Nopco's Industrial Div.** in Harrison, which produces insoluble metallic stearates for a number of industries, including plastics.

John (Spike) Conway, formerly an assistant manager of the chemicals division of **Carbide and Carbon, a Div. of Union Carbide and Carbon Corp.**, 30 E. 42nd St., New York 17, N. Y., is now a purchasing agent for Union Carbide. Prior to his association with Carbide and Carbon, Mr. Conway was sales manager of **Hatco Chemical Co.**

John W. Nixon has been appointed plant manager of **National Petrochemicals Corp.'s** operation at Tuscola, Ill. Mr. Nixon has been chief engineer at the plant since he joined the company in 1952.

Frederic F. Bingham has been appointed sales manager of **Harmon Colors, B. F. Goodrich Chemical Co.**, Rose Bldg., Cleveland, Ohio. He will direct sales operations for the company's line of color pigments and dispersions, which are used in plastics and other fields. Mr. Bingham will make his headquarters at the Harmon sales office in Haledon, N. J.

Carlton Bates, formerly executive vice president, has been named president of **Solvay Process Div., Allied Chemical & Dye Corp.**, 61

Broadway, New York, N. Y. He succeeds **A. B. Chadwick**, who has retired after 44 years of service.

Joseph G. Davidson, vice president of **Union Carbide and Carbon Corp.**, has been chosen to receive the Chemical Industry Medal for 1955.

In his own researches, Mr. Davidson pioneered the development of ethylene glycol for dynamite and anti-freeze, the glycol ethers and esters that contributed greatly to the lacquer industry, the ethanolamines that form the bases of synthetic detergents and an important gas purification process, the vinyl resins, and numerous other valuable industrially new materials. Some 28 patents have been issued on his work.

Mr. Davidson received an award in 1954 from The Society of the Plastics Industry, Inc. for his inspired leadership and faith in the development of vinyl plastics.

Herman R. Thies, general manager of **The Goodyear Tire & Rubber Co.'s Chemical Div.**, Akron 16, Ohio, has received a company emblem in recognition of a quarter-century of service with the company. Mr. Thies has headed the Chemical Div. since it was organized in 1948 and was named to his present post in January 1954. He joined Goodyear as a rubber research compounder in 1930; in 1942 he became manager of **Pliolite** sales and in 1945 was made manager of the **Plastics and Coating Dept.**



H. R. Thies

Leonard I. Meisel, supervisor of the Plastics Branch of the **Naval Air Experimental Station**, Philadelphia Naval Base, has successfully completed participation in the United States Civil Service Commission's Senior Management Intern Program, which is designed to help develop promising Federal employees for higher executive responsibilities. Mr. Meisel was one of 19 selected by a screening process from Federal agencies all over the country to participate in the program.

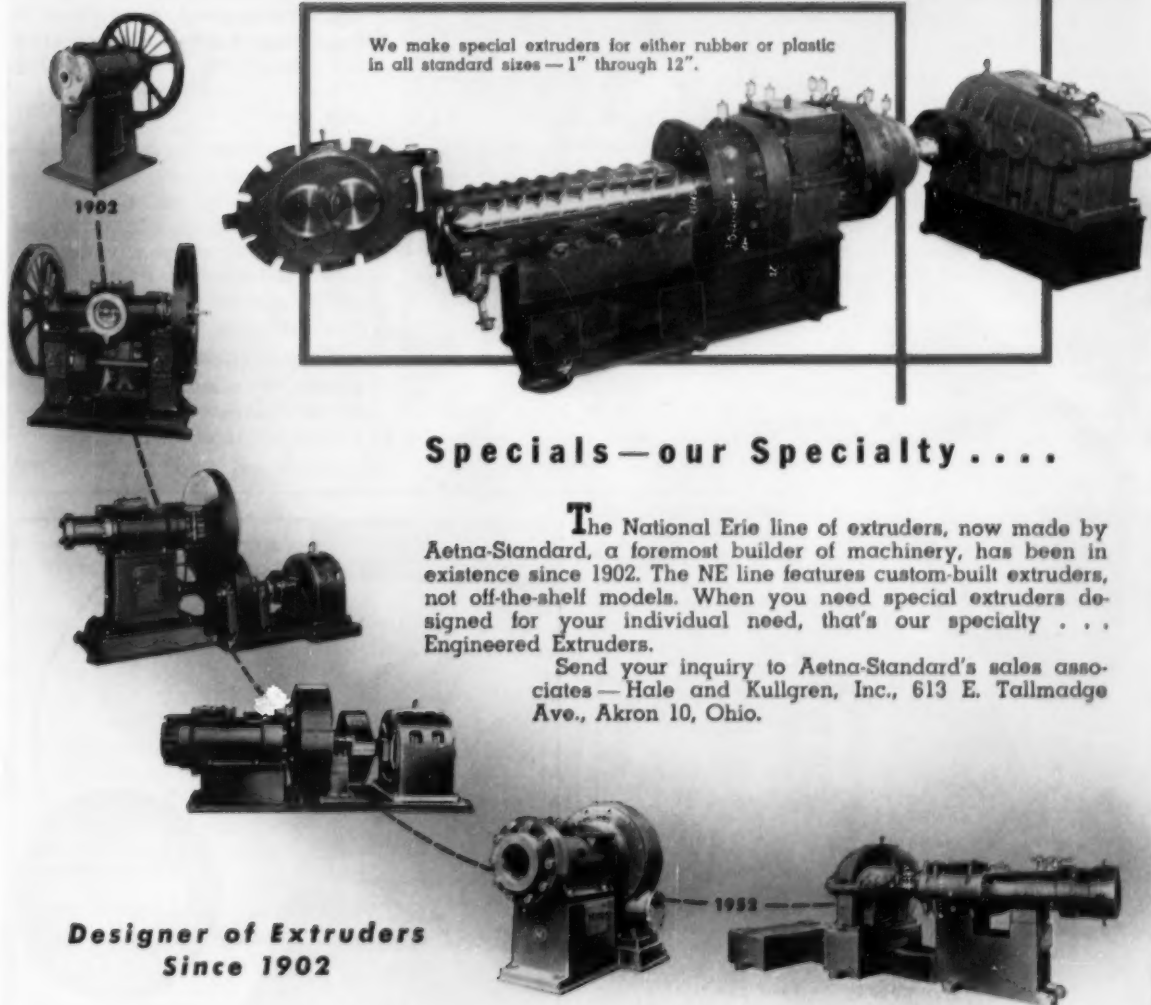
George S. Taylor has been named plastics technical representative of **Hercules Powder Co., Inc.** for the



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Detroit, Mich., area. His headquarters will be in the Fisher Bldg., Detroit.

J. C. E. Fuller is now in charge of market development for new products of **Naugatuck Chemicals Div., Dominion Rubber Co. Ltd., Elmira, Ont.**

C. M. Chase, Jr. has been appointed assistant to the president of **Bakelite Co.** in the field of special engineering economic studies. Mr. Chase joined the parent company, **Union Carbide and Carbon Corp.**, in 1939 and has held several executive positions in the Quality Control Div. In 1946 he was named head of the Quality Control Dept., working with thermosetting materials, and was assigned to thermoplastic quality control in 1947. Since 1952, Mr. Chase has been responsible for coordinating quality control of Bakelite products among all plants.

George W. Martin, formerly general manager of the Plastics Div. of

Noma Lites, Inc., has joined **Adams Plastics Co., Inc.**, Holyoke, Mass., as manager of the Molding Div. Adams is a subsidiary of **Ekco Products Co.**, Chicago, Ill.

Gene Frost has rejoined **Goodall Fabric, Inc.**, 1430 Broadway, New York, N. Y., as stylist and designer of the Plastics Div.

Clifford Off, Jr. has been appointed to handle the sale of polyisocyanate resins for **Chase Chemical Corp.**, Pittsburgh, Pa. Mr. Off was formerly sales manager and a director of **Insul-Mastic Corp.** of America.

George O. Morrison has been appointed to the newly created post of assistant to the general manager of **Shawinigan Resins Corp.**, Springfield 2, Mass. He will act as consultant to the research, technical service, patent, and development departments. Mr. Morrison was formerly director of research and development of **Shawinigan Products Corp.**, Milltown, N. J.

E. S. Coleman has resigned as president and sales manager of

Filmwood Corp., Merchantville 8, N. J. He has not made known his plans for the future. Filmwood prints wood grain and marble patterns, as well as custom patterns on plastic sheets for vacuum forming, and are printers for the high-pressure laminate trade.

Glen A. Nebel has been named West Coast representative of **Catalin Corp. of America** and will make his headquarters at 440 Seaton St., Los Angeles, Calif. Catalin has previously maintained a warehouse at this location and will soon add nylon and polyethylene to its present line of injection molding materials available there.

Paul L. Filter has been named to head the public relations section in the New York City office of **The Dow Chemical Co.** Mr. Filter has been with the company since 1949. **Laveta Barnett** will continue to handle all consumer products made of Dow materials.

Philip L. Dennett has been appointed vice president and comptroller of **Lawrence Process Co., Inc.**, Lawrence, Mass., manufacturer of

Large Size

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Compression molded thermoplastic sheet users now have available larger sizes of Acadia polyethylene. These are available in the new size of 36" x 36" x 1/8".

Standard sizes are furnished in 20' x 20' from 1/8" to 1" thick and 24' x 24' from 1/8" to 1/2" thick. Special sizes are also available. Polyethylene, Polystyrene, Tenite, Saran, Vinylite, Geon, Ethylcellulose, Styraloy, and Nylon sheets can be compression molded in most of the above sizes. Wire or write for specifications.

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extruded plastics and vinyl compounding.

L. A. Doan is now assistant general manager of **The Dow Chemical Co.'s Western Div.**, San Francisco, Calif. Mr. Doan, who joined the company in 1941, has been western sales manager for the past four years.

Jean H. Nesbit has been named Midwestern sales representative of **National Polychemicals, Inc.**, Wilmington, Mass. He will handle sales in New York, Ohio, western Pennsylvania, eastern Indiana, and eastern Michigan.

James O'Sullivan, formerly president of **Argus Plastics, Inc.**, 411 E. Market St., Indianapolis 4, Ind., has disposed of his interest in the company to **Robert Wildes and Elwood Rogers** of **E-W Mold & Tool Co.**

George H. Sherrard has been appointed vice president of **Cordo Chemical Corp.**, Norwalk, Conn.

Raymond B. Seymour, formerly of Atlas Mineral Products, has been named president of **Loven Chemical of California**, Newhall, Calif.

Mahlon G. Milliken has retired as a vice president and member of the executive committee of **Hercules Powder Co., Inc.**, Wilmington 99, Del. He will, however, remain as a member of the company's board of directors until the end of the year.

Mr. Milliken invented and perfected the Milliken Continuous Digester for the production of nitrocellulose, which eliminated the slower and dangerous batch method. For many years he was a member of the plastics steering committee of the Manufacturing Chemists' Association, serving for two years as chairman.

Theodore S. Hodgins, vice president of **Reichhold Chemicals, Inc.**, White Plains, N. Y., has been appointed director of the Chemical and Rubber Div. of the Business and Defense Services Administration, U. S. Dept. of Commerce, Washington 25, D. C. Mr. Hodgins succeeds H. W. Bertine of General Chemical Div., The Allied Chemical & Dye Corp., who has been on loan to BDSA under the industry cooperative executive rotation plan since January 1955.

Edward I. Walters is now sales manager of **Plastic Products Corp.**,

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at **LOW** Concentrations

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Cleveland, Ohio. He will direct the sales of the company's line of fibrous glass reinforced plastics consumer and specialty items.

John W. Dersch has been named plant manager of **Pioneer Latex & Chemical Co.**, Middlesex, N. J. He will be in charge of the company's latex and asphalt emulsion manufacturing operations and engineering.

Warren E. Hill has been elected president and director of **Thermoid Corp.**, 41 E. 42nd St., New York,

N. Y. Mr. Hill was formerly vice president and general manager of Pro-lon Plastics Div., Pro-phy-lac-tic Brush Co.; Shellmar Products Co.; and Plax Corp. He had served terms as director and treasurer of



W. E. Hill

The Society of the Plastics Industry, Inc. Thermoid is a producer of automotive brake linings and industrial rubber products.

Dr. Robert B. Mesrobian, consultant to the nuclear engineering division of the Brookhaven National Laboratory, Long Island, N. Y., has been promoted to the rank of professor of polymer chemistry at **Polytechnic Institute of Brooklyn**. With his promotion from associate professor to professor, Dr. Mesrobian becomes associate director of Polytechnic's Institute of Polymer Research. **Dr. Herman F. Mari** is the Institute's director.

Deceased

Francis J. Stokes, founder and chairman of the board of **F. J. Stokes Machine Co.** died in Philadelphia at the age of 81. He had served as president of the company for 53 years.

MEETINGS

Sept. 10-14—Screen Process Printing Association National, Seventh World Convention and Exhibit, Ambassador Hotel, Atlantic City, N. J.

Sept. 19-22—Society of Industrial

Packaging and Materials Handling Engineers, Tenth Anniversary National Meeting, Kingsbridge Armory, New York, N. Y.

Sept. 27-Oct. 2—National Plastics Progress Show, Mechanics Bldg., Boston, Mass.

Oct. 1-9—Second Annual Cleveland Do-It-Yourself, Hobby, and Photo Show, Public Auditorium, Cleveland, Ohio.

Oct. 5-9—World Plastics Fair and Trade Exposition, National Guard Armory in Exposition Park, Los Angeles, Calif.

Oct. 6-8—Society of Industrial Designers, Eleventh Annual Meeting and Design Conference, The Woodner Hotel, Washington, D. C.

Oct. 10-12—Office of Naval Material, in Cooperation with all Military Services and the Dept. of Commerce, First Joint Military-Industry Symposium on Packaging and Materials Handling, Washington D. C. Firms interested in making presentations on new developments in the field, and individuals wishing to suggest questions for round-table discussions, should advise the Chief of Naval Material, Washington 25, D. C.

Oct. 13-14—The Society of the Plastics Industry, Inc., New England Section Meeting, Equinox House, Manchester, Vt.

Oct. 13-15—Committee on Vacuum Techniques, Inc., Second Symposium on Vacuum Technology, Mellon Institute, Pittsburgh, Pa.

Nov. 8-10—Packaging Association of Canada, Fourth Canadian National Packaging Exposition and Banquet, C.N.E. Automotive Bldg., Toronto, Ont.

Nov. 14-15—TAPPI National Plastics Meeting, Brooklyn Law School, Brooklyn, N. Y. Theme: "Fibres and Plastics for Laminates."

Nov. 27-30—American Chemical Society, Ninth National Chemical Exposition, Public Auditorium, Cleveland, Ohio.

Nov. 27-30—American Institute of Chemical Engineers, Annual Meeting, Statler Hotel, Detroit, Mich.

Dec. 5-9—International Exposition Co., New York, N. Y., Twenty-fifth Exposition of Chemical Industries, Commercial Museum and Convention Hall, Philadelphia, Pa.



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EMPLOYMENT • BUSINESS OPPORTUNITIES • EQUIPMENT (used or resale only)

MACHINERY and EQUIPMENT FOR SALE

KUX 2 1/2" dia. single punch Preform Machine. Loominater 8 oz. Injection Molding Machine. Plastic and Rubber Equipment. Farrell 14"x40", 15"x36" and 6"x12", 3 roll mills. Mills and Calenders up to 84". New Seco 6"x12" and 6"x18" Lab. Mixing Mills and Calenders. Plastic & Rubber Extruders. Wat-Stillman 75 ton automatic Molding Press 26"x26" platens. 100 ton Hobbing Press 18"x14" platens. HPM 200 ton 30"x48" platens. New Loomis 340 ton. 34"x56" platens. 200 ton Brunswick 21"x21" platens. 14" ram. 150 ton Bolling 20"x20" platens. Southward 30 ton 14"x14" platens. semi-auto. Also Lab to 2000 tons from 12"x12" to 48"x48". Hydr. Oil Pumps. Goulds 75 HP motor Dr. 2 stage Centrif. Pump 250#. W.S. 4 Pigr. High and Low Pressure Hydr. Pump. Elmes Hor. 4 Pigr. 4500 lbs. and 5500 lbs. Hydr. Accumulators. Stokes Automatic Molding Presses. Rotary & single Punch Preform Machines 1/2" to 4". Injection Molding Machines 1 oz. to 32 oz. Baker Perkins Jacketed Mixers. Plastic Grinders. Heavy duty mixers, gas boilers. Partial listing. We buy your surplus machinery. STEIN EQUIPMENT CO., 107-4th Street, Brooklyn 15, N.Y. 8Terling 8-1944.

FOR SALE: 3—National 10"x20", 6"x14" Two Roll Mills; 2—Baker Perkins 100 gal. 50 gal. jacketed double arm Mixers; 2—Stokes Rotary Preform Presses DDB 2, D3; 3—Stokes Model "R" single punch Preform Press; 1—Kux Model 15-25 double action Rotary Press; 2—Cumberland #8 Rotary Cutters; Also: Sifters, Cutters, Banbury Mixers, etc., partial listing; write for details; we purchase your surplus equipment. BRILL EQUIPMENT CO., 2407 Third Ave., New York 51, N.Y.

FOR SALE: Injection Molding Machines, 22 oz. IMPCO, 16 oz. H.P.M., Late type machines, 9 oz. H.P.M., 8 oz. W. & S., 4 oz. De Mattia, 1 oz. Nav-Way. Mod. 252 Stokes closure press, Ball & Jewell plastic grinder. AARON MACHINERY CO., INC., 45 Crosby Street, New York 13, N.Y.

FOR SALE: Stainless Steel Rotary Dryer. Link Belt Co., 52"x26", No. 562-16, with all auxiliary equipment. Also: 600 lbs. also 6"x24" and 6"x18" 1/2" Horsepower Stainless Steel Rotary Dryers. Reply Box 94355, Modern Plastics.

FOR SALE: Cumberland Model "O" Granulating Machine, direct coupled, high base, 4 HP, 3 Phase 220/440 Volt 60 Cycle motor. New type blades. Excellent condition. \$250.00 FOR CHATHAM, N.Y. CRELLIN PLASTICS CORP., Chatham, New York. Tel.: Chatham 2-3221.

FOR SALE: 8 Cavity Wall Tile Mold with Automatic Cutter—A-1 Condition. Owner will guarantee production potential. \$1750.00 complete. STYLETTE PLASTICS, INC., 148 S. 25th St., Pittsburgh 3, Pa.

INJECTION MOLDING MACHINES: 3—12 oz. Lesters and 1—4 oz. Lester, 4—3 oz. Fellowa, 1—12 oz. Impeco, 1—23 oz. Reed-Prentice. Can be seen running in our plant. Reply Box 91355, Modern Plastics.

SAVE WITH GUARANTEED REBUILT EQUIPMENT: HYDRAULIC PRESSES: compression molding Dunning & Boschert 3—12" ram 170 ton, 3—10" ram 115 ton—Baldwin Southward 4—28"x20" 8" ram, 75 tons; 5—28"x20" 7" ram, 87.7 tons; 5—15"x15" 8" ram, 75 tons; 4—14"x14" 8" ram, 75 tons; 2—18"x24" 10" ram, 75 tons; 18"x18" 7" ram, 57.7 tons; 3—12"x12" 7 1/2" ram, 60 tons; 8"x9", 4 1/2" ram, 20 tons; D&B 12"x12" 3" ram, 10 tons; LABORATORY PRESSES: Carver 6"x6" 10 ton, W&S 6"x6" 20 tons; Preform Presses 5 1/2" T Colton and Stokes R. M.D.; NEW UNIVERSAL DUAL PUMPING UNITS: 2-15 HP, NEW LABORATORY MILLS AND CALENDERS, also extruders, mixers, vulcanizers, injection molding units, etc. UNIVERSAL HYDRAULIC MACHINERY CO., INC., 295 Hudson Street, New York 13, N.Y.

BUTTONDEX MACHINES: Slightly used machines for sale at bargain prices. Reply Box 90555, Modern Plastics.

REED-PRENTICE 24 OUNCE Injection Molding Machine (10H-24) 6 years old. Fully equipped with 50 H.P. Motor, Wheeler instruments, timers, etc. 24,500 lb. injection pressure, 600 ton clamp, 15" opening, 30x30 die plates. Extra equipment, Glengarry weigh feeder. This machine is in very good condition and has had excellent maintenance. Available immediately. PLASTIC MOLDED PROD. CO., Chicago 30, Illinois.

R. F. HEATING UNIT: RCA Radio Frequency Generator for dielectric heating applications. Type 15 B. Input 40 KVA; 3 phase, 230 V.; 50/60 cycle. Output approximately 10 KW. Frequency range 7-10 M.C. Willing to sell at fraction of original cost of \$11,000. AMERICAN CYANAMID COMPANY, Attn: Mr. W. M. Bowco, 1937 West Main Street, Stamford, Connecticut, Telephone Fire-side 8-7331, Ext. 418.

FOR SALE
RCA Electronic Power Generator, type 15-BM, suitable for preheating and softening plastics, output 15 KW at 2.5 or 10 MC, input 205/240 volts, 3 phase, 60 cycle, 35 KW. LIKE NEW. For complete information—Write, wire, please.
WHITE ELECTRIC MOTORS
430 Broadway Lowell, Mass.

8 CAVITY DIE for plastic wall tile, each cavity 4 1/2"x4 1/2". Was used in 8, 12 & 16 oz. injection molding machines. Can be examined in New York City. Owner retiring from business. Original cost in 1951 \$4100. Will sell for \$1700. Reply Box 92855, Modern Plastics.

FOR SALE: Heat Seal—Grommeter-Radio Receptor—Fully Automatic. Reply Box 94055, Modern Plastics.

FOR SALE: 200 T. HPM Fastraverse Fiberglass press 64"x60" Pl. Williams & Turner Preformers. Injection Presses: 4, 8, 12, 16, 24, 32 oz. Reeds, 2, 4, 9 oz. HPM, 32 oz. Vertical HPM, 8, 12, 20 oz. Lester, 12 & 48 oz. Watson, 4 oz. Lewis (Makray), 1, 2 oz. VanDorn, 1 oz. Vertical Pacomakhi Scrapgrinders, Ovens, Meridian Tom. Circulator, Compression Presses: 50 to 600 tons, 50 tons Stokes Standards, 15 tons Stokes Automatics. Preform presses: 25 HP and 30 HP Gas-Boilers, Autovac Vacuum Form. machs. 52"x30", 200 T. Hobbing Press. List your Surplus Equipment with me. JUSTIN ZENNER, 823 Waveland Ave., Chicago 13, Ill.

FOR SALE: 1—Royle #4 Extruder, motor driven; 1—6"x12" Laboratory Mill, m.d.; 1—Ball & Jewell Rotary Cutter, size O m.d.; 2—Baker-Perkins Size 15, 100 gal. Jacketed Mixers; 5—Horizontal Dry Powder Rotted Mixers, 4000#, 1500#, 500#; 1—New 3 Roll 6"x16" Laboratory Calender; 1—Farrell-Birmingham 60" Mill with reduction drive, 150 HP motor, floor level mounting; 1—Fitzpatrick "D" Comminator, S.S. contact parts, jacketed; 1—Mikro Pulverizer #2th, with motor; 4—Reed-Prentice & W-S Injection Molding Machines, 2-16 oz.; Also other sizes: Hydraulic Presses, Tubers, Banbury Mixers, Mills, Vulcanizers, Calenders, Pellet Presses, Cutters. Send us your inquiries. What have you for sale? CONSOLIDATED PRODUCTS CO., INC., 50 Bloomfield Street, Hoboken, N.J. Hoboken 3-4425, N.Y. Tel.: Barclay 7-0600.

FOR SALE: (11) 75 ton record presses, complete @ \$2,450, (11) new 100 ton, 10" ram, 10" stroke @ \$1,100, (8) 200 ton, 9" stroke, 14" ram, 36x36 @ \$1,550, (7) 200 ton, 9" stroke, 15" ram, 30x30 @ \$1,550, (1) 50 ton complete, 18x18 @ \$1,850, (1) 200 ton, 16" ram, 30x30 @ \$2,450, (2) 200 ton, 16" ram, 42x42 @ \$2,850, (1) 200 ton, 15" ram, 42x42 @ \$2,450, (4) 250 ton, (3) 12" rams, 30x60 rebuilt @ \$3,375. HYDRAULIC SAL-PRESS CO., INC., 388 Warren Street, Bklyn, N.Y.

FOR SALE: Electronic Heat Sealer complete with press and air attachments. New condition because used experimentally exclusively, never in production. Cost \$1300.00, will sell for less than half. Write or call ROSE PATCH & LABEL COMPANY, Grand Rapids, Michigan.

FOR SALE: Hobbing Press 600 Ton W.S. (2) 300 Ton W.S. Presses 20x20 & 29x24 Platens. 140 Ton W.S. 22x16 Platen. 85 Ton Waterbury Farrell 20x24 Platen. 63 Ton Press 15x15 Platen with Pullback Cyls. 3, 2, 4, Oz. Injection Molding Machines. 15 Ton Lab. Presses 16x16 Platen. 15 Ton Lab. Presses 6x6 Platen Ball & Jewell Plastic Grinders. Standard Mystic Embossing Presses, Accumulators, Pumps, Valves. Many other Presses—Send For Bulletin. No. 252 Stokes Closure Press, 700 Ton National Erie 38x38 platens, 250 Ton W&S 25x24 Platens, 113 Ton Farrell 16x36 Platens, 80 Ton Farrell 24x24 Platens. AARON MACHINERY CO., INC., 45 Crosby St., New York 12, N.Y. Tel.: Walker 5-8390.

FOR SALE: "Day" Jumbo Stainless Steel Powder Mixer, 175 cu. ft.; 1200 gallon Stainless Steel Tank; "Hudson-Sharp" Cellophane Wrapper Model 2W-8; 1500# and 3000# Crutchers; 12x32 and 16x40 Roller Mills; "Day" #4 Double Arm Mixer; "Triangle" Powder Packaging Line; Liquid Filling Line with Screw Capper and Pony Labeler; "Pack-age Machinery" Wrapper Model 8; 10" Extruder; "Marion" and "Munson" Mixers. I. E. NEWMAN, 5602 Blackstone, Chicago, Illinois.

(6) 4 OZ. LESTERS, 1953, fully automatic, \$55,000; 40 oz. H.P.M.: 48 oz. DeMattia, new, fully hydr. 40 oz. H.P.M., \$28,000; 32 oz. Lester, 1950, \$22,000; 32 oz. Reed-Prentice, 1950, \$26,500; 24 oz. Reed-Prentice, 1950, \$17,500; 22 oz. Impeco w/transfer plunger; 16 oz. H.P.M., \$9,000; 16 oz. Watson-Stillman, \$16,500; 12 oz. Impeco vert., \$8,000; 12 oz. DeMattia, 1952, \$16,500; 12 oz. Reed-Prentice, 1952, \$14,500; 12 oz. Lester, \$7,500; 12 oz. Watson-Stillman, 1950, \$13,000; 9 oz. H.P.M., 1946, \$5,500; 9 oz. H.P.M., 1943, \$4,000; 8 oz. Reed-Prentice, 1946, \$6,500; 8 oz. Reed-Prentice w/10 oz. cyl., \$8,500; 8 oz. Reed-Prentice, 1948, w/plunger advance, \$7,500; 8 oz. Lester, 1950, \$7,750; 6 oz. Reed-Prentice, \$5,500; 6 oz. Lester, \$4,000; 6 oz. Haringen, \$1,650; 4 oz. H.P.M., \$3,350; 4 oz. Reed-Prentice, 1948, \$5,200; 4 oz. Impeco w/larger cyl., \$5,500; 4 oz. Lewis, 1953, \$5,000; 4 oz. Lester vert., \$4,500; 4 oz. Lester, \$3,250; 3 oz. Fellowa, \$6,500; 2 oz. Reed-Prentice, \$1,350; 2 oz. Van Dorn, lever type, \$1,750. 3 1/4" Hartig extruder, \$2,500; new powder mixers, \$315; 150 ton Stokes closure presses; 150 ton Stokes w/high speed trans. ram; 235-A Stokes; (11) 32 ton compression presses, self-contained, \$1,250 each; new grinders w/8 1/2"x10" throat; tile molds; variety of molds made in England, reasonable. Small plant near Worcester, Mass. with one 8 oz. Reed-Prentice machine and building—\$18,000. ACME MACHINERY & MFG. CO. INC., 102 Grove Street, Worcester, Mass. Tel.: Pleasant 7-747.

FOR SALE: MILLS: 1—EEMCO 20"x32"x60", 200 HP Motor and Speed Reducer, 4—FARRELL 18"x50", 250 HP Speed Reducer. Available as a Mill Line or Individual Units. 4—FARRELL 16"x40", 150 HP Motor and Speed Reducer. MIXERS: BANBURY #1, Completely Chrome Plated Interior for Plastics, 50 HP Motor Drive, Oil Heating System, Automatic Control. BAKER-PERKINS, Jacketed, 2 1/2 Gallons, Gear-Motor Drive, EXTRUDERS: 6" ROYLE #4, 6" ALLEN-WILLIAMS RAPIDO, 4 1/2" NATIONAL RUBBER, 3 1/2" HARTIG, 2" ROYLE #1, all Individual Motor Drive. INJECTION MACHINES: IMPCO VF-823 and VF-824, 350 Tons Clamp, HPM Model 200-H, 9 Oz. 200 Tons Clamp, HPM Model 350-H-16, 16 Oz. 350 Tons Clamp, REED-PRENTICE 12 Oz. 1952 Machine, REED-PRENTICE and WATSON-STILLMAN 2 Oz. HYDRAULIC PRESSES: ELMES 1000 Ton Hobbing Press, MD Pump, BALDWIN-SOUTHWARK 3500 Ton Belt Press, HPM 750 Ton, Self-Contained, WATSON-STILLMAN and HPM 100 Ton Burroughs 75 Ton Electrically Heated, HPM 35 Ton Molding Presses, WATSON-STILLMAN and Elmes 30 and 20 Ton Lab Presses. STOKES Model 200D-3 and Model 235 Automatic and 200 Ton, 150 Ton and 150 Ton Semi-Automatic Presses, TABLET MACHINES: STOKES S-5, R. T. and RD-3 and COLTON 35 and 65 1/2. MISCELLANEOUS: B & J 1 HP Rotary Cutter, Calenders, Grinders, Pumps, Valves, Platens, etc. JOHNSON MACHINERY COMPANY, 683P Frelinghuysen Avenue, Bigelow 5-2500, Newark 5, New Jersey. WHAT HAVE YOU FOR SALE? WHAT ARE YOU LOOKING FOR?

(Continued on page 274)

Chief Manufacturing Executive Fiberglass Reinforced Plastics

A progressive company engaged for several years in the development, engineering, and production of glass reinforced plastic products, which has recently constructed and occupied a new, modern plant and office building to accommodate its growing business, is seeking to round out its organization by the addition of a man qualified to take full responsibility for all manufacturing operations.

The company is principally engaged in matched die molding with fourteen hydraulic presses and three preform machines now in operation. Accordingly, thorough practical experience in all phases of these operations, including molds and machines, is essential. Familiarity with hand layup processes in which the company is also engaged is desir-

able. A sound knowledge of mechanical engineering and well developed executive ability are required. Possession of know-how-to-do is indispensable.

This is an exceptional opportunity. Successful performance can lead to the acquisition of a stock interest in the company on a most attractive basis.

Written replies are requested containing a reasonably complete statement of education, experience, previous business associations, personal details, and some indication of salary requirements. Communications will be held in strict confidence and should be addressed to the personal attention of Lawrence V. Meyering, President.

CAMFIELD FIBERGLASS PLASTICS, INC.
Zeeland, Michigan

RECTO Injection • Compression • Transfer Molding of **PLASTICS** *Since 1920*



Plastic products are developed from
idea to completed product by RECTO

**MOLDS MADE IN
OUR OWN PLANT**

RECTO MOLDED PRODUCTS, INC.

Custom Molders of Plastics Since 1920

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opportunities in **PLASTICS and RUBBER MOLDING**

Major blue chip company in East and Midwest, engaged in compression and injection molding, extrusion, forming and other processes, needs **PRODUCT ENGINEERS, PLANT and PROCESS ENGINEERS (EE, ME); METHODS ENGINEERS.**

Also **DEVELOPMENT ENGINEERS (ME, EE, CH E)** plus **PRODUCT DESIGNERS, ORGANIC and IN-ORGANIC CHEMISTS**, for launching new ventures.

Unusual opportunity.

Reply with resume, salary requirements and location preference to **BOX 91955.**

CLASSIFIED ADVERTISING

(Continued from page 272)

FOR SALE: 1—Stokes T-4 preform press, MD; 1—Hall & Jewell #1 cutter; 2—Cumberland 14" rotary chipping machines; 1—National Erie 8 1/2" strainer; 1—Erie 200 ton self-contained molding press; also mills, mixers, extruders, etc. CHEMICAL & PROCESS MACHINERY CORP., 146 Grand Street, New York 13, N. Y.

AVAILABLE AT BARGAIN PRICES

Mitts & Merrill 15CD Rotary Cutter, J. H. Day, from 3/4 up to 100 gal., Imperial and Cincinnati D. A. Jacketed, Sigma Blade Mixers, Day 15 to 10,000 lbs. Dry Powder Mixers, Baker Perkins Heavy Duty (Steam Jacketed) Double Arm, from 5 to 200 gal., Mixers (Under and Vacuum also), Gomco 2000 lbs. 56 cu. ft. Double Cone Blender, Mikro Bantam, 18H, 2TH, 3W, 3TH, 4TH Pulverizers, Day, Rotex, Tyler Hummer, Robinson, Raymond, Gayco, Great Western Sifters, Colton 2HP and 3 HP Rotary & 5 1/2" Tablet Machines, Carver Laboratory 20 ton hydraulic Press, Package Machy, FA, FA2, FA4, U4, Miller, Hayssen, Wrap-King, Scandia, Oliver Auto. Wrappers—all sizes. This is only a partial list. Over 5000 machines in stock available for immediate delivery. Tell us your machy. requirements. UNION STANDARD EQUIPMENT CO., 318-323 Lafayette St., New York 13, N. Y.

FOR SALE: National Rubber Machinery Co. 2 1/2" plastic extruder. Complete with conveyor, grinder, drives, stock of dies. Like new. Can be operated for inspection. Available immediately. Reply Box 94855, Modern Plastics.

FOR SALE: (2) W&P 100 gal. Double Arm Sigma Blade Jacketed Mixers; (1) Day 30 gal. same. (2) Kux Rotary Pellet Presses, model 25, 21 and 25 punch; (1) Stokes RD-3. PERRY EQUIP. CORP., 1429 N. 6th St., Phila. 22, Pa.

FOR SALE: Imported extruders. Latest developments, self-contained. Moderately priced. For details write or call: ACME MACHINERY & MFG. CO. INC., 102 Grove Street, Worcester, Mass. Tel.: PLeasant 7-7747.

MACHINERY and EQUIPMENT WANTED

WANTED: Stokes 15 ton automatic press. State year, condition, and price. MORSKIL COMPANY, 415 Lexington Ave., New York, N. Y.

WANTED: 200 and 300 Ton late model self-contained Compression Molding Presses in good operating condition. Watson-Stillman, HPM, or French Oil preferred. Also, 3KW, or 5KW Girdler Electronic Preheaters. Reply Box 92255, Modern Plastics.

WANTED: Damaged screws from Windsor HC-100 MARK I Extruders. Advise condition and extent of damage. Reply Box 92355, Modern Plastics.

WANTED: Hydraulic Press, Plunger Type, to operate on 3000 P.S.I. water pressure, 200 to 250 tons clamp with 10" to 14" travel, 25 to 50 tons top ram pressure 10" minimum travel, 12" minimum daylight between dieholders and with adjustable bottom K.O. Reply Box 92855, Modern Plastics.

WANTED: Resin Kettles, stainless steel or glass lined, from pilot plant up to 2000 gal. sizes. Also Rotary Pellet Presses; B & J cutters; Mikro Pulverizers, etc. Send us your list of surplus equipment. PERRY EQUIPMENT CORP., 1429 N. 6th St., Phila. 22, Pa.

WANTED: Used 6 x 12 or similar laboratory 2-roll mill. State condition, price, etc. Reply Box 94855, Modern Plastics.

MATERIALS FOR SALE

SPECIAL OFFERING

Virgin Tenite I, Color Group II 007A-16269-S Bright Red; 007A-22145-S Bright Blue; 10,000 lbs. of each. Nylon—Natural 3000 lbs. and Colors 5000 lbs.—FM 10001—Also Polyethylene—Reprocessed pellets at low prices. Black—20,000 lbs. Natural—25,000 lbs. HIGH IMPACT POLYSTYRENE: Save money with our Reprocessed High Impact Polystyrene in many bright colors such as, Red, Blue, Green, Yellow—30,000 lbs. Also Pink, Charcoal Gray and matched colors—35,000 lbs.

A. BAMBERGER CORPORATION,
703 Bedford Ave., Brooklyn, N. Y.
Telephone MAin 5-7450.

FOR SALE: 20,000 lbs. each Red and Blue Styrene Pellets. Surplus lot Red Acetate Pellets—15,000 lbs. Both attractively priced. We are also in the market for all surplus plastic scrap and powder. PLASTIC MOLDING POWDERS, INC., 2064 MacDonald Avenue, Bklyn., N. Y. Tel.: EB 5-7943.

VULCALOCK CEMENT, 600 gal. Armstrong Water Proof cement, 2,600 gal. Dolphinite Fire Proof Fiberglass Size, 2000 gal. Dolphinite Water and Rust Proof, 2000 gal. Ocher Yellow, pigments in oil, 49,000 lbs., Gray Deck Stain, 4,500 gal. Acetylene tetrachloride, 660 drums (approx. 900 lbs. each). Samples, information and attractive prices available. REDWOOD INSULATION COMPANY, Walla Walla, Wash.

50,000 LBS. RIGID VINYL SHEET SCRAP
Clear, White & Assorted Colors
Lowest Prices

CLAUDE P. BAMBERGER, INC.
152 Centre Street, Brooklyn 31, New York
Tel.: MAin 5-5553
Not connected with any other firm
of similar name.

MATERIALS WANTED

WANTED: Plastics Scrap and Rejects of all kinds, ground and unground. Also rejected molded pieces and surplus virgin molding powders. Top prices paid.

A. BAMBERGER CORPORATION
703 Bedford Ave., Brooklyn 6, N. Y.
MAin 5-7450

CLEAR ACRYLIC MOLDING POWDER SCRAP wanted by end user either reground or unground. Also nylon molding powder scrap needed. Highest cash prices paid. Reply Box 91155, Modern Plastics.

SCRAP PLASTICS: All forms, waste and surplus plastic molding materials, rejects in any form. We will also buy your obsolete inventories of molding powders, stabilizers, plasticizers and other plastic and chemical materials. ACETO CHEMICAL CO., INC., 40-40A Lawrence St., Flushing 64, N. Y. INdependence 1-4100.

WANTED: PLASTIC SCRAP. Polyethylene, Polystyrene, Acetate, Acrylics, Butyrate, Nylon, Vinyl. GEORGE WOLOCH, INC., 691 West 26th Street, New York 1, N. Y.

WANTED: Plexiglas and Lucite scrap, salvage and cut-offs, any quantity. DUKE PLASTICS CORP., 544 Broadway, Brooklyn 6, N. Y. Tel.: EVERgreen 8-5520. Note new address!

END-USER of Rigid Poly Vinyl Chloride and Poly Vinyl Chloride Acetate desires large quantities on long term contract or spot basis. Material must be free from metal or rubber. Reply Box 92455, Modern Plastics.

ALL TYPES OF MOLDED REJECTS,
sheet trim, surplus inventories
and obsolete parts.

CLAUDE P. BAMBERGER, INC.
152 Centre Street, Brooklyn 31, New York
Tel.: MAin 5-5553
Not connected with any other firm
of similar name.

MOLDS FOR SALE

FOR SALE OR EXPORT: Metal draps and vacuum forming shell molds of Xmas items for illuminated displays, Santas (all sizes), sleighs, candles, angels, reindeer, candy canes, bells, etc. All for half of original cost. Also many other molds in stock for novelties, etc. Reply Box 90455, Modern Plastics.

MOLDS FOR SALE: Injection Molds—domestic use or for export: Spice Rack—Napkin Holder—Toiletory Tray—Planter—English style Cigarette Case—Oval Jewelry Box. All Molds perfect condition guaranteed. 8 cavity 6" plastic ruler, inches and metric. Reply Box 91755, Modern Plastics.

MOLDS WANTED

WE ARE INTERESTED in acquiring molds for export to European countries, either inactive, or active with license, to produce abroad. Interest is for novelties, toys, kitchen articles, utensils, etc. Offers with specifications, prices and samples where available, will be submitted to our clients for prompt action. Please address replies to HARRY KRIEGER COMPANY, 152 West 42 Street, New York 36, N. Y.

WANTED: Toy molds for injection presses wanted. It is preferable that these for its use be for children 1 to 5. Give full details in your letter. GERBER PLASTIC COMPANY, 8th and Spruce St., St. Louis 2, Missouri.

PLANTS FOR SALE

FOR SALE
Complete wood floor mill. Capacity 10 tons per 24 hours, using nearby supply of pine and poplar. For further particulars, reply Box 94955, Modern Plastics.

FOR SALE: Well established extrusion plant located in Midwest now in operation. Fully equipped for plastic pipe and custom extrusions. Present personnel will remain. Reply Box 90155, Modern Plastics.

MODERN, one story, sprinklered, daylighted building, over 20,000 sq. ft. One area equipped for heat curing & controlled humidifying. Several specially constructed fire and explosion proof vaults (plastic storage). Location southwest New York State. Excellent & cooperative skilled labor available. Possession immediate. For lease or sale. RALPH KLONICK CORP., REALTORS, 901 Sibley Tower Bldg., Rochester 4, N. Y.

PLASTIC PLANT FOR SALE
Complete Drawing and Forming Plant ready for use. Gas Fired Furnace, Fosteria Electric Oven, 15 Ton Press, Lathe, Saws, Routers, Sanders, Shop Tools, etc. Vacuum and Air Systems, etc. Available for inspection. Thirty minutes from Chicago Loop. Reply Box 93755, Modern Plastics.

HELP WANTED

FLOOR TILE CHEMIST WANTED
Experienced manufacture Vinyl Tile. Good salary, liberal insurance, hospitalization and retirement. Replies will be confidential. Reply Box 90755, Modern Plastics.

WANTED: Asphalt Coatings and Adhesive Chemist on full time or consulting basis. Midwest company desires to develop a line of asphalt coatings and adhesives for the building industry. Please reply giving complete background information to Box 90055, Modern Plastics.

(Continued on page 276)

MAY 1954



Production stepped up 25% with
NEW DURITE GP-102

JUNE 1954



Faster curing new
DURITE GP-102 adds **25%** capacity

JULY 1954



FOR VERSATILITY...
NEW DURITE GP 102

DURITE
GP-102
is all we claimed!

**Just one year old—the industry's
pace-setting general purpose phenolic molding compound!**

When we introduced new DURITE GP-102 last May . . . we promised a pace-setting phenolic molding compound.

Today—results such as these obtained by leading molders have proved the superiority of GP-102 beyond any doubt:

Faster curing—GP-102 steps up production as much as 25% from each press.

Exceptional versatility—GP-102 is ideal for large moldings or small, intricate or simple, thin-walled or heavy-sectioned.

Uniform quality—GP-102 assures you of consistently high quality in every piece you mold . . . because it is carefully controlled from raw materials to the finished compound. Batch to batch uniformity is assured.

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(Continued from page 274)

WANTED

Plant Superintendent. Capable of taking full charge. Must know technique of injection, compression and plunger molding. Knowledge of molds and tools essential. Send complete data first letter. Reply Box 93955, Modern Plastics.

PLASTICS: Man with actual button experience in polyesters wanted to take charge of new factory. Salary and bonus. Reply Box 91255, Modern Plastics.

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Experienced heavy or light gauge calendaring. Good salary, liberal insurance, hospitalization and retirement. Replies treated confidentially. Reply Box 96955, Modern Plastics.

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TOOL ROOM FOREMAN

Large midwest plastic injection molder requires Tool Room Foreman for ten man mold maintenance shop. Good background of experience required. Reply Box 92355, Modern Plastics.

PLASTICS ENGINEER: Immediate opening for experienced Plastics Engineer to head up field service and experimental molding laboratory work. Must have several years experience in injection molding of various thermo-plastic molding compounds. Experience with the formulation of cellulosic plastics desirable but not essential. Submit resume giving full details including salary requirements to F. J. Bishop, **CELANESE CORP. OF AMERICA**, 290 Ferry St., Newark, New Jersey.

JOB OPPORTUNITY IN PLASTICS DEVELOPMENT

With a successful, progressive, well established Michigan manufacturer—Man with imagination, technical background in plastics, some sales experience, and ability to initiate and complete plastics development projects. Prefer at least five years experience in plastics field. Knowledge of thermoplastics and thermosetting resins, techniques used in molding, extruding, laminating, bonding, casting, calendaring, etc. To develop and expand present plastic pipe extrusion operation into further lines. Should have growth potential for advancement to job of higher responsibility. Send complete statement of qualifications. Reply Box 92155, Modern Plastics.

WANTED—PLASTIC PIPE SALESMEN

Large plastic pipe extruder located in Metropolitan New York interested in contacting salesmen throughout the United States. Reply Box 94555, Modern Plastics.

VINYL COLOR MATCHER

Require man experienced in color matching and production color control in film and sheeting. Reply Box 96655, Modern Plastics.

A-1 EXTRUSION MAN: Well experienced, especially in small diameter tubing, rods and special shapes. Capable of taking charge of shop in small, progressive extrusion plant and growing with the business. Reply Post Office Box 656, Columbus, Ohio.

CHEMIST—VINYL COATING: Require chemist experienced plastisol formulations for fabric coating operation. Good opportunity. All replies confidential. Our employees know about this ad. Reply Box 91655, Modern Plastics.

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Thoroughly experienced Production Superintendent capable of organizing and supervising production, pattern design and mold making is offered position in fast growing region of South America with excellent opportunities. Full resume and salary requirements to Box 94155, Modern Plastics.

WANTED: Man between 30 and 45 years old to supervise engineering operations in a modern four machine injection molding plant with an established enviable record. The man we want must be thoroughly familiar with mold construction techniques and operation particularly in the field of precision molded nylon parts. To an aggressive, ambitious man with the proper qualifications we can offer an excellent starting salary and bonus. Our plant is located in a large northeastern city known for its excellent living conditions. Reply Box 93655, Modern Plastics.

MANUFACTURER'S REPRESENTATIVES PRINTED POLYETHYLENE BAGS: Many exclusive territories open east of the Mississippi for men or organizations with allied, non-competitive lines of packaging materials or supplies to earn sixable additional income selling custom-printed polyethylene bags directly to industrial, soft goods, and food packagers. **HERB-SHELLEY, INC.**, Farmington, Minnesota. Att: General Sales Manager.

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with Record of Ingenuity and Originality in Research and Development of quality Metal and Plastic Building Components. Very large, progressive manufacturer in middle western city, who is establishing a new general research and development division, solicits applications for employment from persons qualified by training and experience for this work. Send complete record of age, training, experience, employment and salary desired with first letter. All applications held strictly confidential and will be acknowledged promptly. Reply Box 94755, Modern Plastics.

WANTED—TOOL ENGINEER: Responsible for estimating, designing and the procurement of plastic molds for thermosetting materials. May perform some sales service work. Seven to ten years experience preferred. Write **AUBURN BUTTON WORKS, INC.**, Canoga Road, Auburn, N. Y., sending full resume of experience and training, with photograph and references, and salary expectations.

WANTED: Ambitious reinforced plastics engineer. Imagination and initiative—experienced from design through production—must be capable of, and familiar with the mixing of formulas and all other phases of this industry. Send complete resume of past experience and salary desired. **ANHEUSER-SCHANTZ MFG., INC.**, 108 S.W. 21st St., Fort Lauderdale, Fla.

WANTED: Salesman, New England Area, for extrusion compounds. Wire and profile industry. Most modern and progressive plant in New England wants highest quality man with technical background as well as sales. Salary and percentage of sales. Replies confidential. Reply Box 93255, Modern Plastics.

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CHEMICAL ENGINEER: B.S., Age 41, Business training, Patents. Diversified experience equipment selection, production, formulation of vinyl plastisols and calender compounds for fabric coating, films and sheeting. Seeks challenging opportunity in technical service or production. Reply Box 90355, Modern Plastics.

MECHANICAL ENGINEER: U.S. Coast Guard Academy grad., 29. One year's experience extrusion and reprocessing, completed course in inj. molding, Newark College of Engineering. Seeks position with well rated firm with mold and product design, molding and extrusion departments. Will relocate, initial salary not prime consideration. Reply Box 93655, Modern Plastics.

GRADUATE CHEMIST: Five years research and production experience in polyesters, acrylics and vinyls with top companies. Excellent references. Presently employed as vinyl research chemist on West Coast. Fluent spoken and written Spanish, capable of translating technical literature. Would like sales or technical service position with reliable company, preferably in Mexico or other Pan American country. Reply Box 91555, Modern Plastics.

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AUSTRIAN CHEMICAL ENGINEER: Extensive technical background. Fully experienced in design and all methods of reinforced polyester application; customers contact. Seeking adequate position in the States. Reply Box 92955, Modern Plastics.

(Continued on page 277)

CLASSIFIED ADVERTISING

(Continued from page 276)

PLASTICS CHEMIST: Female. Experience in polyesters and cellulose. Ten years diversified background includes organic synthesis, formulation and evaluation. Desire position in research or development. Reply Box 93555, Modern Plastics.

SALES AGENTS WANTED

WANTED: Capable Sales-Engineering Representation in Plastic Molding field for outstanding and newly acquired line of Compression and Transfer Molding Presses with 20 years successful history. Send full data with background and experience, territory covered, and present lines handled. Reply Box 90255, Modern Plastics.

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MANUFACTURERS' REPRESENTATIVE wanted by manufacturer of compression molded plastic parts in the Metropolitan and New England areas. Sales on commission with small salary. Reply giving experience and present lines to Box 93155, Modern Plastics.

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PLASTIC SALES REPRESENTATIVES
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MISCELLANEOUS

EXPRD. MFGRS. REPS. offer excellent sales representation to extruder of sheets used for forming. Possibly interested in other plastics. Cover midwest out of Chicago office. Best references. Reply in confidence to Box 92755, Modern Plastics.

BABY ITEMS: Wanted to buy, assemble and sell. We have nationwide distribution in this field. Reply Box 92555, Modern Plastics.

HAVE AVAILABLE small active extrusion plant, desire to combine with working partner who has active plastic extrusion, injection molding or allied plastic process business. Or will consider working partner with small investment. Must have extensive knowledge and experience in any of the aforementioned fields. I have available one new 3½" plastic extrusion machine, misc. equipment, tool room, active accounts, 10 years experience and excellent business credit rating. I intend relocating in N. Y. Metropolitan area or Westchester County only. Replies considered confidential. Reply Box 90855, Modern Plastics.

AMBITIOUS, INTELLIGENT YOUNG MAN desires to invest money and talent in the plastics industry. Age 29, B.S. in Chemistry. Full background in polymer chemistry. Prefer expanding, sound, small company. Reply Box 91655, Modern Plastics.

BRITISH COMPANY of specialty wax blenders would invite the co-operation of similar American concern with a view to manufacturing specialty compounds under license. Representative available New York end September to discuss possible co-operation. Reply Box 91455, Modern Plastics.

WELL-ESTABLISHED German wholesale plastic materials firm having wide connections with German manufacturers of plastic sheets and tubes wishes to find an American firm capable of and interested in supplying raw materials for German markets. Interested companies contact **HANS CHR. FRIEDRICHSEN**, Hamburg 13, Rothenbaumchaussee 36, Germany.

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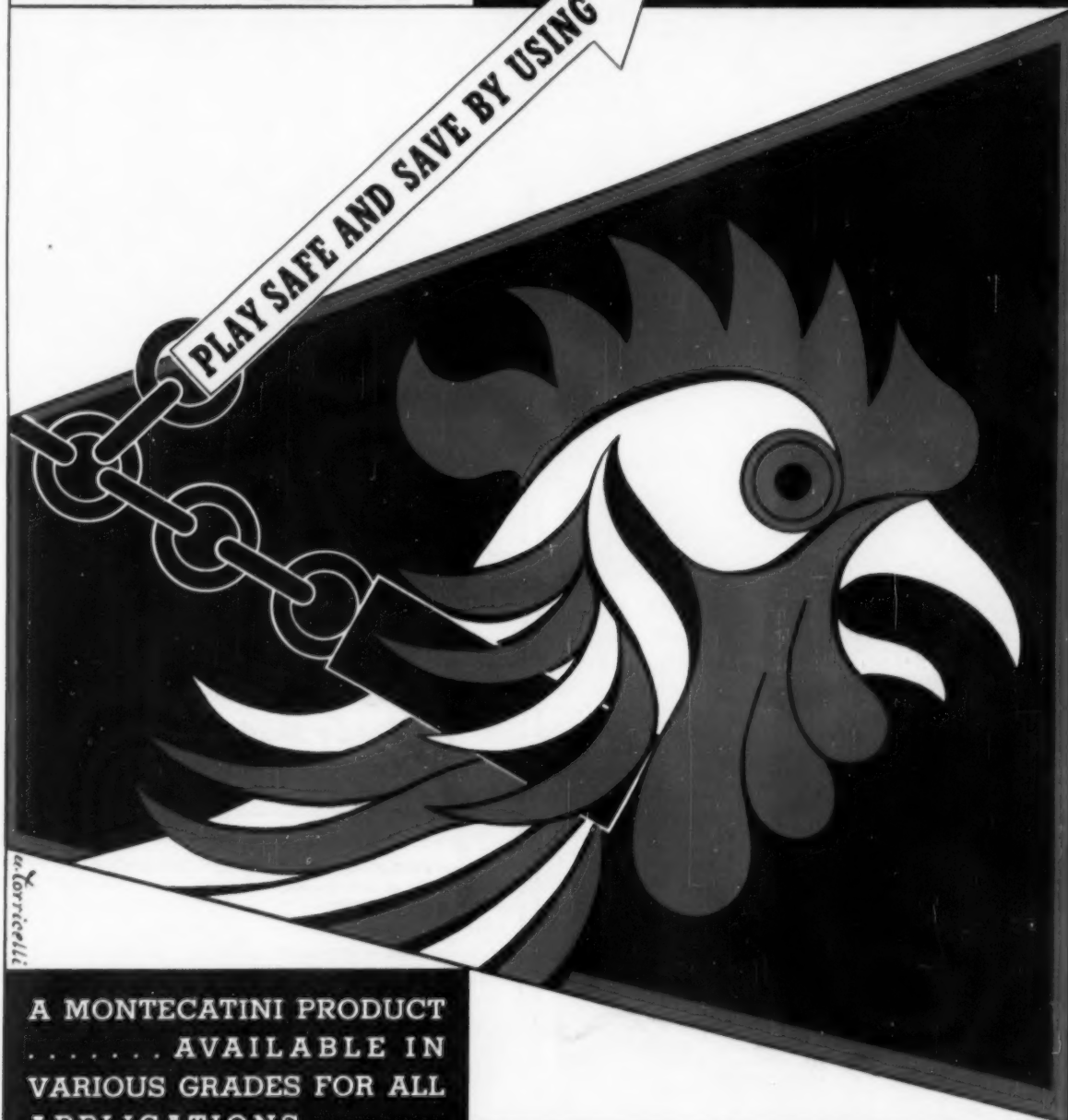
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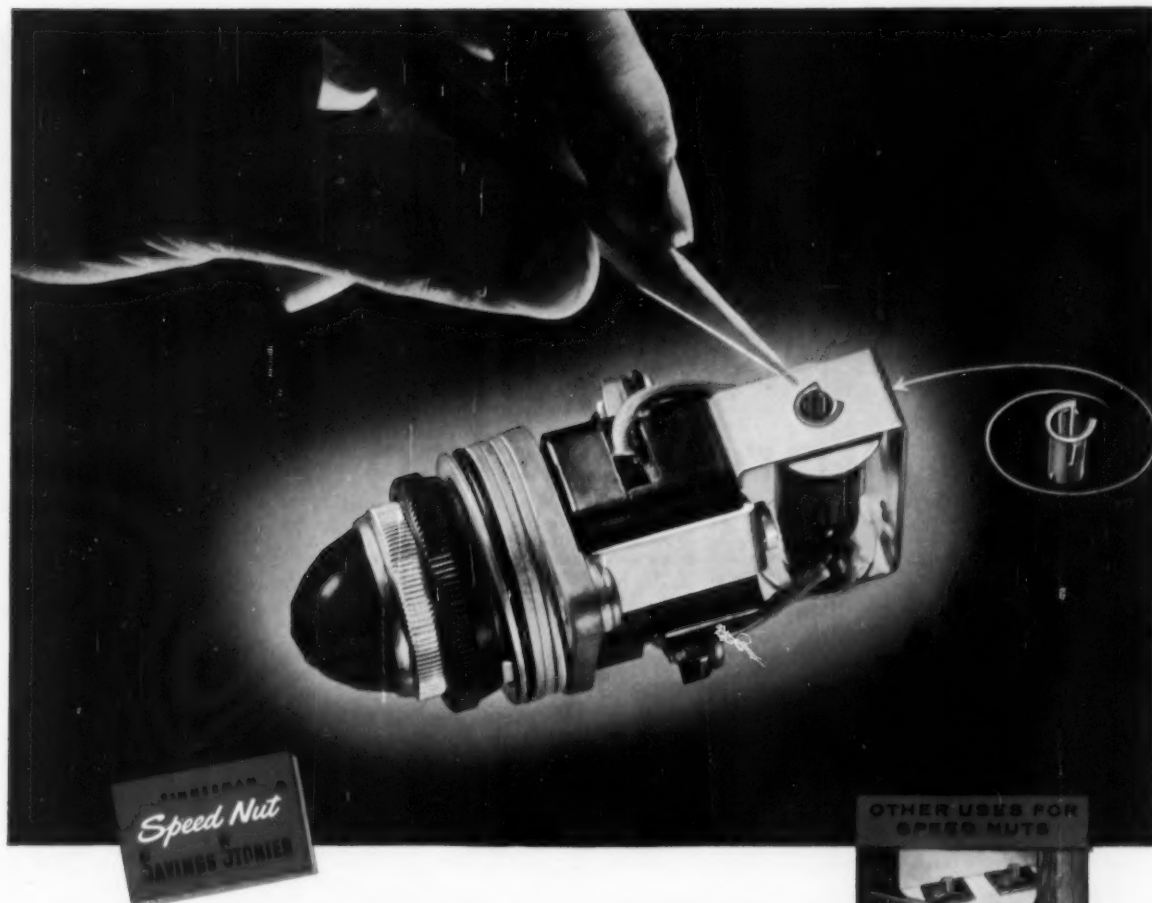
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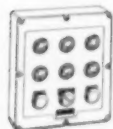
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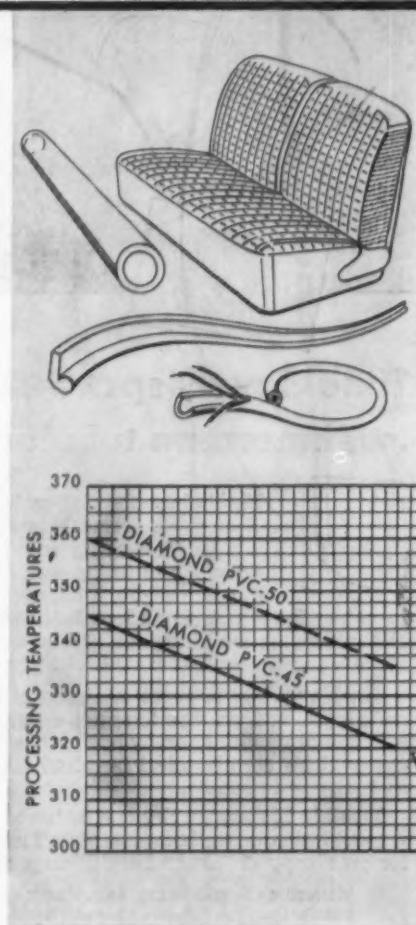
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**Diamond
Chemicals**

PITTSBURGH PX PLASTICIZERS

The *Basic* Way to Better Plastics Formulations

PX-104

DiButyl
Phthalate

Especially suited for use in nitrocellulose lacquers, polyvinyl chloride coatings and phenolic resin laminating varnishes.

PX-108

Dilso Octyl
Phthalate

A popular, general-purpose plasticizer with an excellent combination of over-all properties.

PX-114

Decyl Butyl
Phthalate

Excellent low-cost plasticizer with good heat and light stability. Particularly suited for extruded products.

PX-118

IsoOctyl Decyl
Phthalate

Ideal where lower volatility and higher permanence than DOP are desired.

PX-120

Dilso Decyl
Phthalate

An economical plasticizer for formulations requiring very low volatility and good permanence qualities.

PX-138

DiOctyl
Phthalate

A basic "building type" plasticizer exhibiting an excellent combination of over-all properties.

PX-208

DilsoOctyl
Adipate

Excellent low temperature properties. Recommended for calendaring, extrusion and vinyl dispersions.

PX-220

Dilso Decyl
Adipate

Combines economy of use with low volatility and excellent low temperature characteristics.

PX-238

DiOctyl
Adipate

Excellent low temperature characteristics. Ideal for calendaring, extrusion and vinyl resin dispersions.

PX-404

DiButyl
Sebacate

Excellent for vinyl film and various oil-resistant rubber compounds and for several cellulosic derivatives.

PX-438

DiOctyl
Sebacate

Widely used as low temperature plasticizer in all types of vinyl compounds.

PX-800

Epoxy

Recommended for products in which stability and permanence properties are of major importance.

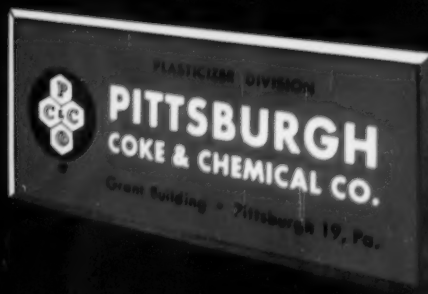
PX-917

TriCresyl
Phosphate

For use in flame-retardant vinyls, in nitrocellulose lacquers and in cellulosic molding compositions.

PITTSBURGH PX PLASTICIZERS are worth knowing *more* about! Complete technical data or samples of *any* of the above products will be sent promptly upon request. For immediate sales service, call a Pittsburgh man at the nearest phone number below.

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